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**Using U.S. Business Registry Data to Corroborate Corporate Identity:
Case Study of the Legal Entity Identifier***

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Abstract:

This paper offers a fresh perspective on fundamental issues in using official incorporation records to corroborate the identity of corporate entities by comparing two publicly-available sets of information, namely, business registry incorporation records and reference data from the Legal Entity Identifier (LEI) system, with some focus on the monitoring function performed by LEI issuers as agents for LEI data users. Three modes of analysis are used to consider these issues, high-level analysis of LEI system data about U.S. entities with LEIs, interviews conducted with U.S. business registries, and entity-level comparisons of business registry and LEI records for entities with LEIs incorporated in the states of Ohio and Massachusetts. The fresh perspective provided here includes attention to key comparison issues such as truncation of Legal Names in official records; significant state-level variation in requirements to provide business address information in incorporation records or periodic reports; recognition that some key business register data may not be readily available or available only at a cost; whether in this context enhancements can be made to the expectations for, and disclosures by, LEI issuers in their monitoring role; and to what extent the high incidence of non-renewal of LEIs might play a role in the quality of LEI reference data. The paper develops measures of scope and degree for many key issues that can arise in using business registry information within an identity-corroboration context. The exceptional transparency of the LEI system allows for detailed comparisons that connect its data quality and value proposition with its sources and methods.

Keywords: anti-money laundering, corporations, counterparty risk, data mapping, financial supervision and regulation

JEL Codes: G200 M100

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Business registries (sometimes called “company registries” or “corporate registries”) are governmental bodies that register various types of corporations (sometimes termed “legal persons”) in their respective jurisdictions and make this registration information available to the public. For the United States, this corporate registration function is generally performed by the secretary of state of the state or territory in which the entity is domiciled.¹ State law allows multiple types of corporate entities in each jurisdiction, for example, limited liability corporations (LLCs), nonprofit corporations, and limited partnerships. Information requirements, fees and other aspects of incorporation requirements also vary by state.

Information available from business registries is an important source for corroborating the identity of customers and counterparties by many market participants including financial institutions, other providers of goods or services, investors, and business partners. Such incorporation records can be an essential resource in many critical business activities of these participants including onboarding of customers, vendors and counterparties.² For example, these participants may use business registry information to confirm information received from a client or other sources, both for their own due diligence and to comply with applicable law and regulation. In particular, such information may play a role in customer due diligence required under anti money laundering and associated laws and regulations.³ Business registry information is also referenced in disclosures in support of public-market securities issuance to provide investor and market transparency on financial instruments. Further, business registry information is used by state and other governments for a variety of official purposes, such as monitoring compliance with tax filing requirements.

In this paper we offer a fresh perspective on basic issues that can arise for anyone who uses official incorporation records to corroborate the identity of corporate entities. In doing so, we compare publicly-available sources of information to provide measures of scope and degree for some of these issues.

This paper explores a specialized instance, the global Legal Entity Identifier (LEI) system, in which public corporate registration records serve as the primary source of corroboration for entities’ identifying information (see Appendix I). In the LEI system, designated monitoring agents (LEI issuers) corroborate identities and reference data under approval and contract (the “master agreement”) with the Global LEI Foundation (GLEIF) which in turn operates the LEI system under policy direction and general oversight

¹ For example, see National Association of Secretaries of State (NASS, 2019).

² Other complementary due-diligence elements methods may include interviews, on-site visits, trade and credit references, credit checks and review of published or internal information such as audited financial statements.

³ See Financial Action Task Force (FATF 2014), paragraphs 29-30 and FATF (2021), including Interpretive Note to Recommendation 24, “Transparency and beneficial ownership of legal persons,” pages 91-95, especially paragraph 5.

by the LEI Regulatory Oversight Committee (LEI ROC).^{4,5} More information on the Global LEI System can be found in Appendix I.

The design and exceptional transparency of the LEI system allows for detailed comparisons that can illuminate how its data quality and value-added to LEI constituencies may relate to its sources and methods. As part of this public-private partnership, the activities of LEI issuers are governed entirely by the master agreement with GLEIF as well as application agreements with individual LEI registrants. As such, neither individual regulators nor the LEI ROC oversee or supervise the activities of individual LEI issuers. For their part, LEI issuers must rely on public information supplemented by whatever the entity is willing to share voluntarily. LEI issuers do not have legal authority to perform deeper due diligence such as that generally performed by regulated financial intermediaries (e.g., the ability to demand disclosure of or access to non-public information from an entity). Moreover, LEI issuers operate under a framework designed to prioritize process efficiency, contain operating costs and minimize LEI registration fees that includes a strict expectation of cost-recovery in LEI issuance operations (i.e., no economic profits from LEI issuance or activities related thereto) and encouragement of price competition among authorized LEI issuers.

This paper is designed to provide information on how these corporate registration data are reflected in LEI records. Corporate registrations are the foundation of the LEI system and corroboration process. This analysis is not aimed at assessing how the Business Registries conduct their business.

This paper draws some inspiration from various indications that, as the LEI system continues to expand and mature, there may be opportunities for that system to better reflect U.S. processes and practices including with regard to U.S. business registries.

We believe this paper provides new and useful information and perspectives on business registry information and makes a number of contributions. Within the bank supervision sphere, this paper illuminates some prudential considerations associated with bank onboarding of new customers, including how to make use of customer data drawn from multiple sources or vendors. For example, it relates closely to some aspects of ongoing dialog between regulators and industry with regard to what is sufficient for due diligence in “know your customer” (KYC) practices and regulatory requirements on the part of bank or other firm.

The findings of this paper should also be informative to LEI ROC, its member agencies, GLEIF, LEI issuers (e.g., DTCC and Bloomberg) and the public with regard to the underlying properties, characteristics and

⁴ This LEI corroboration process arrangement can be framed broadly within the economics literature on information asymmetry between a principal (GLEIF under broad oversight of LEI ROC) and agents (LEI issuers) who make decisions on information sources to be used for corroboration, how various scenarios are reported within the LEI system, and what comprises “fully corroborated” information. Relevant streams in the economics literature begin with Ross (1973).

⁵ A key element in such monitoring is the nature and degree of due diligence performed by the intermediary to establish the identity, characteristics and reference data relevant to identification. In the case of financial intermediaries, regulators expect this due diligence would generally incorporate more than verification of corporate registration information. Banking and securities laws in the United States enable financial intermediaries to undertake this broader due diligence, which may include reference-checking, provision of financial statements and documents, review of internal/external reviews and audits, and onsite visits or other shoe-leather techniques.

reliability of LEI reference data and how these elements relate to broader topics in entity identification. For example, it describes policy and operational issues that can arise in corroborating LEI reference data, awareness of which can in turn be useful to data users in aligning their expectations with regard to sources of possible error in the identity-corroboration process. Moreover, while presented here in the context of U.S. business registries and the LEI system, these issues extend naturally to governments, market participants and others seeking to corroborate identities of corporate entities using their own or vendor-based datasets of corporate entities.⁶

Finally, and specifically with regard to the LEI system, identifying and documenting the issues described here helps to enable further development of the value of the LEI for its constituencies and for the broader public. From a data quality perspective, GLEIF and the LEI system may be able to use these insights to identify new business processes, such as additional front-end data-acceptability checks and clearer expectations for LEI issuers that can, in turn, help to increase the degree to which the corroboration process is “straight-through processing” for LEI issuers and GLEIF bringing benefits in transparency and efficiency. From a more strategic perspective, awareness of these issues can assist data users in better recognizing the properties and limits of data available from business registries as well as corroboration by LEI issuers using such data; acknowledging that significantly more business registries and legal forms should be accommodated; considering the implications of longstanding dormant or not-updated records; and incorporating the possibility of data or corroboration errors, or even fraudulent information, into dialog about LEI.

We offer three contributions:

- We provide a high-level analysis of GLEIF database for LEIs issued to U.S. entities, including alignment of key reference data elements (jurisdiction of formation, registration authority, validation authority and entity legal form). This portion of the analysis concentrates on how various elements of business registry information on a given entity should be kept in alignment in order to provide clear corroboration of corporate identity data. It focuses on those U.S. business registries with the largest number of registrants that have been issued LEIs (“Top U.S. Business Registries”).
- We offer information about practices and requirements at individual U.S. state business registries, including interviews with leadership of four business registries (Delaware, Ohio, Massachusetts and Texas). This portion of the analysis concentrates on how identity corroboration practices may need to take account of differing state-specific practices and requirements with regard to incorporation information and how it is made available.
- We perform a detailed and systematic comparison of LEI records against the corporate registration dataset at the business registry for two states (Ohio and Massachusetts), utilizing methods that compare corresponding data elements and that help to limit/mitigate the possibility of “confirmation bias.” This portion of the analysis concretizes and quantifies some of the topics raised in the first two portions using matched entity-level information.

⁶ This paper benefited greatly from cross-fertilization with staff engaged in the Federal Reserve System’s ongoing internal Project FRANCIS, which analyzes how datasets from vendors, LEI and regulatory sources can be used to create a mapping of corporate identifiers and reference data. Such a mapping can improve the connectivity of these data sets and thereby the value and efficiency of Federal Reserve research and analysis.

The paper concludes with a discussion of the extent to which its findings might be influenced by the high proportion of non-renewed LEIs (“lapsed LEIs”) among U.S. entities and the inability of the LEI issuer to update information without renewal.

High-Level Analysis of GLEIF Data

Roughly 235,000 entities with legal address in the United States had obtained LEIs as of June 30, 2021.⁷ Although it does not feature in the analysis presented in this paper, it is worth noting that the largest LEI issuers for U.S.-based entities with LEIs are GMEI, which is an affiliate of Depository Trust & Clearing Corporation (DTCC), and Bloomberg LEI. The entities are generally incorporated through a variety of corporate business registries (exhibit 1). Analysis of these listings can illuminate the presence (or absence) of logical relationships one might expect among data fields.

There are 28 GLEIF-listed Registration Authorities (RAs) in the U.S. with at least 1,000 LEIs issued to U.S. entities each. These RAs account for about 169,000 LEIs, nearly three-fourths of all U.S. RAs and one-tenth of the global total. By this measure, Delaware Division of Corporations is the largest RA in the U.S. and sixth largest in the world. Three Federal sources appear on this list (SEC/EDGAR, FDIC, NCUA). The FDIC and NCUA listings (which amount to about 2 percent of the U.S. entities with LEIs) likely indicate that the LEI issuer relied upon data published by those agencies in corroborating LEI reference data, even though the entities in question were incorporated under a different jurisdiction.

The LEI system distinguishes between “Registration Authority” and “Validation Authority” elements of the Common Data File. At present there is no “Incorporation Authority” concept in the LEI system, even though there is a “Jurisdiction of Formation” concept as part of the LEI record. Any registry listed on GLEIF’s Registration Authority codelist (GLEIF 2021b) is treated as a valid entry in the LEI system for Registration Authority, Validation Authority or both elements. As noted later, there may be some ambiguity in the LEI system as to what a Registration Authority or Validation Authority represents. Under GLEIF procedures, FDIC and NCUA should instead have been listed as “Validation Authorities” rather than Registration Authorities.^{8 9}

The top 10 U.S. Registration Authorities (including Delaware) account for roughly 60 percent of the U.S. total. For convenience this total combines the two Registration Authorities listed for New York State (New York Division of Corporations and New York Division of Financial Services) and Texas (Texas Corporation Section and Texas Department of Banking Register).

⁷ This count is based on the entities’ country of legal address as reported to LEI issuers and in the LEI system. All LEI counts in this paper exclude LEIs that are Anulled, Duplicate, Merged or Retired.

⁸ The list of Registration Authorities with fewer than 1,000 entities with LEIs includes other federal financial regulators such as the Federal Reserve/FFIEC National Information Center which would better be considered as Validation Authorities. Lack of a clear distinction between “registration authority” and “validation authority” with regard to banking-related entities was a key theme of the Banking agencies staff report (2020).

⁹ The GLEIF data record structure also accommodates one “Other Registration Authority” and multiple “Other Validation Authority” entries. This element is thinly populated. Among the 235,126 U.S. entities with LEIs, only 121 (0.05 percent) had an entry in the “Other Registration Authority” element and none had “Other Validation Authority” entries.

Exhibit 1: Registration Authorities by Number of U.S. Entities with LEIs

RA Code	Registration Authority	Total
RA000602	Delaware Division of Corporations	70,459
<i>RA000665¹</i>	<i>U.S. Securities & Exchange Commission</i>	<i>13,969</i>
RA000598	California Secretary of State	11,262
RA000628/747	New York Division of Corporations/Division of Financial Services-Insurance	8,139
RA000603	Florida Division of Corporations	8,054
RA000637	Texas Corporations Division/Texas Trust Company Registry	6,613
RA000629	Ohio Corporation Database	4,785
RA000632	Pennsylvania Department of State	4,182
RA000608	Illinois Business Services	3,847
RA000613	Massachusetts Corporation Division	3,529
Top Ten Registration Authorities Total		134,839
RA000616	Michigan Corporations Division	3,398
RA000625	New Jersey Business Records Service	3,286
RA000604	Georgia Secretary of State Corporations Division	2,406
<i>RA000744¹</i>	<i>U.S. Federal Deposit Insurance Corporation</i>	<i>2,393</i>
RA000621	North Carolina Corporations Division	2,332
RA000614	Maryland Business Services	2,307
RA000642	Wisconsin Corporation Section	2,064
RA000639	Virginia State Corporation Commission	1,960
RA000609	Indiana Business Services Division	1,825
RA000641	Washington Corporations Division	1,795
RA000600	Connecticut Commercial Recording Division	1,765
RA000627	Nevada Business Center	1,484
RA000599	Colorado Business Division	1,400
<i>RA000745¹</i>	<i>U.S. National Credit Union Administration</i>	<i>1,360</i>
RA000618	Missouri Corporations Unit	1,207
RA000617	Office of the Minnesota Secretary of State Business & Lien System	1,159
RA000597	Arizona Corporation Commission	1,155
RA000631	Oregon Corporation Division	1,143
Registration Authorities with more than 1,000 LEIs (28) - Including Top Ten		169,278
Registration Authorities with fewer than 1,000 LEIs		12,563
U.S. Entities with "Temporary" or "Other" Listed as Registration Authority		53,285
Total (U.S. Entities with LEIs)		235,126

NOTE: Data are as of 30 June 2021 and exclude LEIs that are Annulled, Duplicate, Merged or Retired.

1. Federal Agencies (which do not incorporate entities) are shown in italics

Source: GLEIF Golden File as of 6-30-2021

It is noteworthy that, for nearly a quarter of the U.S. entities with LEIs, the entities report their Registration Authority as “Temporary” or “Other.”

Among the U.S. entities with LEIs, about three-quarters have LEI reference data deemed “Fully Corroborated” (exhibit 2, column f) by the respective LEI issuer based on its review of business registry records. Another two percent are deemed “Partially Corroborated,” (column g) with the remaining 22 percent being “Entity Supplied Only,” (column h) that is, the LEI issuer relied solely on documents provided by the entity and not separately corroborated as the basis for reference information and identity as reported in the LEI system.

Exhibit 2: U.S. Entities with LEIs by Level of Corroboration and Lapse Status

LEI Registration Status	Total (a)	Percent of Total (b)	Corroboration - Level			Corroboration - Row Percentages		
			Fully Corroborated (c)	Partially Corroborated (d)	Entity Supplied Only (e)	Fully Corroborated (f)	Partially Corroborated (g)	Entity Supplied Only (h)
Current (“Issued”)	109,419	46.5%	99,854	1,368	8,197	91.3%	1.3%	7.5%
Lapsed	125,699	53.5%	79,816	3,428	42,455	63.5%	2.7%	33.8%
Other	8	0.0%	5	0	3	62.5%	0.0%	37.5%
Total	235,126	100%	179,675	4,796	50,655	76.4%	2.0%	21.5%

Source: GLEIF Golden File as of 6-30-2021

The level of corroboration differs significantly between “Current” and “Lapsed” LEI records. More than 90 percent of the current records are also fully corroborated, where “current” denotes they are less than one year old or have been reviewed by, and paid an annual fee to, the LEI issuer through the LEI annual renewal process (exhibit 2, column f).¹⁰ In contrast, only about 60 percent of the lapsed records are fully corroborated, where “lapsed” indicated the entities are not up-to-date in the LEI annual renewal process. Another one-third of the lapsed records are entity supplied only. The majority of the LEIs issued to U.S. entities are lapsed (53.5 percent) and, as discussed later, most of the lapsed records have been in that status for many years.

Accordingly, the remainder of this section concentrates on the nine Top U.S. State Registration Authorities (Top Registration Authorities), that is, the Top Ten Registration Authorities except for the SEC (exhibit 3).¹¹ This population encompasses nearly 121,000 entities in the LEI system (column a). Some seven of the Top Registration Authorities are currently the only GLEIF-recognized Registration Authority in their jurisdiction. (New York and Texas each have two GLEIF-recognized Registration Authorities.)

¹⁰ In the LEI system, those records that are up-to-date in the annual review process or are less than one year old and that have paid required LEI fees are termed “Issued.” For clarity to readers, this paper uses the term “Current” rather than “Issued.” There is no difference in meaning.

¹¹ For the remainder of this paper, the LEIs and LEI counts refer to entities listed as incorporated in individual states regardless of the Legal Address of the entity. This choice is convenient for analytical purposes and does not materially affect the results.

Exhibit 3: Top U.S. Registration Authorities (based on LEIs issued)

State	Registration Authority	"Home" Registration Authority (a)	SEC is Registration Authority (b)	Another Known Registration Authority (c)	Registration Authority is RA999999 or RA888888 (d)	Combined (Total Formed in Jurisdiction) (e)
Entities formed in Jurisdiction with a ELF assigned from that Jurisdiction						
DE	Delaware Division of Corporations	69,116	61	100	8,197	77,474
CA	California Secretary of State	10,705	7	80	1,122	11,914
NY	New York Division of Corporations/Division of Financial Services-Insurance	7,872	12	96	2,616	10,596
FL	Florida Division of Corporations	7,862	4	47	476	8,389
TX	Texas Corporations Division/Texas Trust Company Registry	6,409	1	61	1,317	7,788
OH	Ohio Corporation Database	3,932	0	50	1,087	5,069
PA	Pennsylvania Department of State	3,955	1	50	1,485	5,491
IL	Illinois Business Services	3,755	4	98	1,271	5,128
MA	Massachusetts Corporation Division	3,379	17	22	863	4,281
Total of Above		116,985	107	604	18,434	136,130
Entities formed in Jurisdiction with ELF of 9999/8888						
DE	Delaware Division of Corporations	1,187	7,180	26	2,049	10,442
CA	California Secretary of State	478	34	162	3,250	3,924
NY	New York Division of Corporations/Division of Financial Services-Insurance	236	128	192	1,710	2,266
FL	Florida Division of Corporations	176	2	83	597	858
TX	Texas Corporations Division/Texas Trust Company Registry	191	27	311	775	1,304
OH	Ohio Corporation Database	846	233	115	1,045	2,239
PA	Pennsylvania Department of State	214	36	169	1,076	1,495
IL	Illinois Business Services	84	26	218	1,006	1,334
MA	Massachusetts Corporation Division	177	4,308	146	2,203	6,834
Total of Above		3,589	11,974	1,422	13,711	30,696
Total		120,574	12,081	2,026	32,145	166,826

Source: GLEIF Golden File as of 6-30-2021

Each of the Top Registration Authority jurisdictions in turn has 5 to 10 unique, jurisdiction-specific Entity Legal Form (ELF) codes assigned by LEI issuers based on primary corporation types available in the respective jurisdiction.¹² These ELF codes are generally developed with an emphasis on the most common corporation types in the jurisdiction, and not necessarily to capture every possible entity type that may be incorporated by the business registry.

Nearly one in five of the Top Registration Authorities' entities show ELF codes for "Temporary" (8888) or "Other" (9999) rather than a specific ELF code/corporate type associated with the jurisdiction in question. Although relatively rare, there is a small proportion of cases in which the ELF code for an entity was from a specific different jurisdiction (46 out of roughly 121,000 entities at the Top Registration Authorities).

These simple tabulations reveal several striking attributes of the LEI records of entities with LEIs at the Top Registration Authorities. A significant minority of the LEI records lack a specific Registration Authority or specific state-connected ELF code, instead showing "Temporary" or "Other" for one or both (nearly 30 percent of the entities with LEIs at the Top Registration Authorities). Roughly 18,000 entities (15 percent of the Top Registration Authorities' entities with LEIs) have an in-state ELF but no specific Registration Authority (upper column d). A further 14,000 entities (12 percent) have neither a specific Registration Authority nor a specific ELF code (lower column d). Another 2,000 entities (2 percent) show

¹² ELF is a jurisdiction-specific set of four-character codes established by the International Standards Organization (ISO) as ISO standard 20275. GLEIF leads the work on maintaining and building out the ELF codes and plays a key role with ISO in maintenance of the ISO 20275 standard.

one state as jurisdiction of formation and a different state's Registration Authority (column c). Appendix III reports these totals for each of the Top U.S. Registration Authorities.

The GLEIF data also point to an interesting issue with regard to the business registry sources of information used for corroboration. The Registration Authority in the LEI record (part of the entity cluster of data elements) may or may not be the actual authority under whose aegis the entity was formed. Thus, the Registration Authority listed in an entity's LEI record is not necessarily the entity's "incorporating authority," a concept that does not explicitly exist in the LEI system at this time. Indeed, the GLEIF codelist for valid Registration Authorities includes authorities which do not incorporate entities but may otherwise provide authoritative information on the entities. For the vast majority of cases, the special LEI system treatment for entities identified as "Funds" (e.g., mutual funds) without a separately incorporated trust appears to be the primary reason. (See Appendix II, "Funds" in the LEI System.) In the same vein, among the full number of entities showing SEC as Registration Authority, about 12,000 entities show a state for Jurisdiction of Formation but the SEC as Registration Authority (exhibit 3, column b). Entities incorporated in Delaware and Massachusetts (where many mutual funds are based) together account for 96 percent of these 12,000 entities. Among the remainder, the Federal Reserve Board (RA000645, sometimes attributed by GLEIF as the National Information Center operated on behalf of the Federal Financial Institutions Examination Council (FFIEC)) is the incorporating authority only for two small sets of entity types but is more often used by LEI issuers as a corroboration source for banks banking-related entities. In this way the Federal Reserve Board/FFIEC fits the definition of a Validation Authority (which is part of the LEI Registration cluster of elements in the LEI system).

Despite this important distinction between the broader set of valid Registration Authorities and the narrower concepts of incorporating authorities or Validation Authorities, GLEIF data indicate that Registration Authority and Validation Authority are the same authority for more than 99.9 percent of the U.S. entities with LEIs.

Without a clear "incorporation authority" concept, this all-but-complete overlap between the two existing concepts in the LEI records of U.S. entities raises the possibility that LEI issuers (and perhaps LEI data users) may not consider the distinction to be meaningful. This would be a surprising conclusion given that some data users may specifically want to know to which laws and regulations the entity in question is subject. Indeed, this would be a typical question for banks or other credit providers to ask in the onboarding or application process.

Further detail on entities in the Top U.S. Jurisdictions can be found in Appendix III.

Interviews with State Business Registries

As a complement to the high-level analysis of GLEIF data, we conducted interviews with four state business registries (Delaware, Ohio, Massachusetts and Texas Corporations Division) covering key registration approaches and methods for each. The interviews generally lasted about an hour.

The business registries' practices have common elements. In particular, the onus is on the filing entity to provide accurate and complete information, and to promptly update the information in business registry filings. Once successfully filed, the business registries have neither authority nor staff resources

to actively police the quality of information in business registry records. As one interviewee phrased it, the business registries' function is "ministerial" in this regard.

In this context, officials acknowledged that at any point in time there is some incidence of inaccurate or even fraudulent filings in the business registry records. For example, as noted by the International Association of Corporate Administrators (IACA), "Corporate identity theft continues to be an issue of importance throughout business registries. As more business registries move to accept filings online, many continue to explore measures to secure that information."¹³ Once evidence of inaccuracy or fraud is established (e.g., through a third-party complaint or a problem with the means of payment), business registries pursue suspected problem registrations through enforcement mechanisms. This process may leave problematic registrations on the books for some weeks or months, during which time bad actors might attempt to leverage these records to obtain money or goods and services under false pretenses. It is beyond the scope of this paper to attempt to estimate the frequency with which such inaccurate or fraudulent filings might occur.

The officials reported that pay walls and subscription services apply to some or all users of business registry data, including LEI issuers, and are a key part of funding the business registry function.

Different reporting expectations apply to entities not incorporated in the state but seeking to do business there, termed "foreign" corporations). For example, if a corporate name is already claimed in that state, another name will need to be chosen to do business in that state (sometimes termed by the business registries as a "fictitious name". The potential need for an entity to adopt a different local name to operate in a different state could affect the ease with which an LEI issuer might be able to choose to corroborate that entity's LEI reference data using a business registry other than the entity's "incorporating authority." In this way, at least in theory, LEI Issuers (like others seeking to use business registry data to corroborate identity) have the opportunity to choose from which state/business registry to extract the corroborating data, for example, based on ease of access or completeness of data in the respective business registry. In contrast, the entity itself makes the choice as to which jurisdiction in which it incorporates.

Among other similarities, business registry filings include some information on key shareholders or organizers but contain little "who owns whom" or corporate-hierarchy information among related legal entities. Business registry records are regularly referenced/accessed by state tax authorities as part of monitoring compliance with tax obligations. State-chartered commercial and savings banks are handled separately from general corporations by the respective state bank regulators. In some cases, business registries may provide some (administrative) support for bank regulators in the registration process.

Filing requirements differ significantly across business registries both in content and format. At the time of the interviews, all four authorities allowed corporate registrations through online processes. Prior to the COVID-19 pandemic, Ohio had required paper documents (i.e., "wet signatures"). The approaches to making registration information available to the public also vary in key respects.

¹³ See IACA (2019), page 24.

The information items collected at incorporation or in required periodic reports differ significantly across the four states. For each state, the specific list of required items is established by statute, and generally noted as such (with corresponding statutory citations) in application forms.

The form in which data are collected and stored may also vary, with concomitant effects on how difficult or costly it may be for LEI issuers or other parties to corroborate information provided by individual entities. For example, some items or some number of entities may be accessible without charge on the business registries' web page, allowing parties to target the specific information items needed for their purposes. Information may be available in data-file format, fixed-form output pages, or in images of the forms submitted (i.e., "image-based" records, for example, in PDF format); in the latter case, a user might need to go through the respective form for each entity of interest in order to obtain corroborating information. Business registries rely upon pay walls and subscriptions to fund a significant portion of their operations subject to oversight of their respective administrations and legislatures. The business registries are not in a position to systematically waive their fees nor to permit pay-only information to be republished freely by others without charge.

Among other differences, the different business registries may apply more or fewer resources to screen incoming files for completeness and compliance with reporting instructions (although fundamentally all of these filings are self-reported). Accordingly, one might expect some degree of difference in the error rate in registration information (for example, spelling or punctuation errors).

For users of business registry data, such as the LEI system, accommodating these differences can significantly affect the cost and efficiency of using business registry records to corroborating corporate identity and data. In some cases, business registries do not require registrants to provide certain types of information. In the LEI setting, a key question confronted by LEI issuers is whether all of the basic LEI data elements ("Level 1") are available in the state registration filings for all entities.

As a context for these interview findings, Appendix III provides a broader comparative perspective from 93 IACA members on public access to registry data. For example, IACA survey data show that many authorities (U.S. and international) require a user to establish an account before searching the business registry, to pay a fee to access the registry information, or (especially) impose charges for bulk searches of registry records. The IACA survey information suggests that most business registries provide free access to search individual entities.

Comparison of Matched Entity-Level Data at Individual Business Registries

We were able to obtain entity-level data sets from two business registries, enabling a systematic comparison of reference data in GLEIF LEI records with those in business registry records. Officials from Ohio and Massachusetts kindly agreed to share their respective datasets for purposes of this research on courtesy basis (normally a fee is charged). Like the rest of this paper, our analysis does not attempt to assess how these two business registries conduct their business.

To develop the entity-level comparisons requires matching of records between the business registry and LEI data sets based on the registry's own filing identifier (e.g., Massachusetts "FEIN" code) and the LEI

“Registration Authority Entity ID” field. This method proved to be quite successful, matching 97 to 99 percent of the records.¹⁴

The as-of dates for the two states’ comparisons differed slightly, creating some possibility that timing differences might influence the analysis. For Ohio, the registry dataset was as of March 28, 2021, and the GLEIF records were as of February 17. For Massachusetts, the registry dataset was as of July 7, 2021, and the GLEIF records were as of June 30. These minor differences in as-of dates between the business registry records and the LEI data should be too small to introduce meaningful inconsistencies or errors in the comparisons.

For each of the two states’ datasets, the principal analytical comparisons came down to three of the six basic elements of LEI reference data: Legal Name, Legal Address (which for simplicity we reduced to City-State-Postal Code), and Legal Form. The remaining three of the six LEI reference data elements were instrumental in setting up the analysis. Local Entity identifier was used for matching with the LEI record, while the jurisdiction of formation and registration authority elements were used to frame the overall exercise. The LEI identifier code itself, which embeds no entity information, did not play a role in the analysis. After completion of the record-matching process, the analysis sets were made up of some 4,592 Ohio entities and 3,371 Massachusetts entities.

The summary statistics of these two state analysis sets tell different stories than those of the full set of U.S. entities with LEIs (exhibits 4a and 4b). Nearly all entities in each of the state analysis sets were deemed Fully Corroborated by LEI issuers (96.9 percent and 98.5 percent, respectively), much higher than the comparable rate for all U.S. entities with LEIs (76.4 percent). The state analysis sets fell on either side of the U.S.-wide rate of LEIs that are current (43.5 percent), with Massachusetts significantly above (58.6 percent) and Ohio below (39.9 percent). Neither state data set showed any entities in the Entity Supplied Only category, the lowest level of corroboration; this contrasts with 21.5 percent across all U.S. entities with an LEI. Both analysis sets indicated the primary LEI issuer was BED B.V. (the affiliate of DTCC) at nearly 80 percent, with a further 20 percent going to Bloomberg.

¹⁴ In performing these matching exercises, it was not possible to ascertain whether there might be additional matchable records in the GLEIF dataset for which there is a respective state Registration Authority without a corresponding registry filing identifier, vice versa or both. We could not evaluate whether this omission occurred with Ohio- or Massachusetts-incorporated entities for which a different Registration Authority was listed or no specific Registration Authority was listed [RA999999/RA888888].

Exhibit 4a: Summary of Analysis Set - Ohio Secretary of State

Registration Authority	Jurisdiction of Formation	Fully Corroborated		Partially Corroborated		Total (e)
		Current (a)	Lapsed (b)	Current (c)	Lapsed (d)	
Ohio Secretary of State	US-OH	1,823	2,620	8	133	4,584
	<i>Of Which: Funds</i>	18	7			25
	US		6			6
Delaware Divn of Corps	US-DE	1				1
Illinois Secretary of State	US-IL		1			1
Total		1,842	2,634	8	133	4,592

Percent Fully Corroborated		96.9%
Percent Current		39.9%
Main LEI Issuers	BED B.V. (DTCC)	78.5%
	Bloomberg	20.7%

Source: Ohio Records Summary

Exhibit 4b: Summary of Analysis Set - Massachusetts Corporation Division

Registration Authority	Jurisdiction of Formation	Fully Corroborated		Partially Corroborated		Total (e)
		Current (a)	Lapsed (b)	Current (c)	Lapsed (d)	
Massachusetts Corporation Division	US-MA	1,956	1,362	18	31	3,367
	<i>Of Which: Funds</i>	598	66	4	2	670
	US-NY	1				1
	US-CT		1			1
	US-FL		1			1
	US-RI				1	1
Total		1,957	1,364	18	32	3,371

Percent Fully Corroborated		98.5%
Percent Current		58.6%
Main LEI Issuers	BED B.V. (DTCC)	76.5%
	Bloomberg	21.7%

Source: Massachusetts Records Summary

After being provided access to business registration data from the Massachusetts Corporation Division and Ohio Secretary of State, we compared GLEIF entity reference data information (Level 1 data) with the respective business registry information. In our samples, we examined 3,371 entities from Massachusetts and 4,592 entities from Ohio (exhibits 4a and 4b).

Allowing freely for differences in the use of upper-case letters, we found legal names matched exactly for 88 percent of Massachusetts entities and 92 percent of Ohio entities.¹⁵

Dataset Comparisons: Legal Name

Matching of Legal Names can be a challenging enterprise because of the many abbreviations, spacing choices and alternative punctuation usages that one can encounter (exhibit 5).

Exhibit 5: Waterfall of Name-Matching between state registry and LEI system for Ohio and Massachusetts

Method	Status	Massachusetts Share (percent) (a)	Ohio Share (percent) (b)
1. Straight-Through Processing (STP)	Exact Match using automated comparison (allowing for capitalization differences)	88.4	91.6
2. Augmented STP	Identify additional non-substantive differences using Visual/Human Review, of which:	6.5	1.9
	• Blank spaces	0.3	0.1
	• Truncation <i>(see discussion below)</i>	6.2	1.8
3. Manual/Not STP	Match additional using Visual/Human Review, of which:	4.0	4.5
	• Punctuation	3.5	3.7
	• Typo/space missing	0.3	0.4
	• Abbreviation	0.1	0.2
	• Other	0.1	0.1
4. Substantive Difference	Remainder/Material or Significant Difference, of which:	1.0	2.0
	• Material Difference	0.3	0.8
	• Significant Difference	0.7	1.2

NOTE: Columns may not sum exactly due to rounding.

We then turned our attention to the residual non-matches. Because some Secretary of State business registries limit their field sizes (for example, the Ohio Secretary of State database appears to limit legal name to 45 characters), additional matches could be made by truncating the GLIEF legal name to match business register name length, under the falsifiable assumption that the missing characters were

¹⁵ This allowance was essential to conduct a meaningful comparison. For example, nearly all Legal Name entries in the Ohio Secretary of State dataset contain only capitalized letters (i.e., no lower-case letters) while GLEIF data generally capitalizes only the first letter in each word of the name.

obvious or did not carry significant identifying information (exhibit 6). An additional 6.5 percent (Massachusetts) and 2 percent (Ohio) entity names could be matched using this method.

Exhibit 6: GLIEF Legal Name Examples and Ohio Company Name Comparison

Truncated LEI Dataset Legal Name Examples	
Business Name (OH SoS)	Entity Legal Name (LEI Dataset)
AKRON COMMUNITY SERVICE CENTER AND URBAN LEAG	Akron Community Service Center and Urban League, Inc.
ARBORS OF DUBLIN APARTMENTS LIMITED PARTNERSH	Arbors of Dublin Apartments Limited Partnership
CARNEGIE PROSPECT HOLDINGS LIMITED PARTNERSHI	Carnegie Prospect Holdings Limited Partnership
THE MCCULLOUGH-HYDE MEMORIAL HOSPITAL INCORPO	The McCullough-Hyde Memorial Hospital Incorporated
YOUNG MEN'S CHRISTIAN ASSOCIATION OF LIMA, OH	Young Men's Christian Association of Lima, Ohio

Truncated LEI Dataset Legal Name Examples - Information Lost for Ohio	
Business Name (OH SoS)	Entity Legal Name (LEI Dataset)
CONNOR/MURPHY REAL ESTATE INCOME AND GROWTH F	Connor/Murphy Real Estate income and Growth Fund IV, LLC
THE CONNOR GROUP REAL ESTATE INCOME AND GROWT	The Connor Group Real Estate Income and Growth Fund VII, LLC
THE CONNOR GROUP REAL ESTATE INCOME AND GROWT	The Connor Group Real Estate Income and Growth Fund X, LLC
THE CONNOR GROUP REAL ESTATE INCOME AND GROWT	The Connor Group Real Estate Income and Growth Fund XI, LLC
THE CONNOR GROUP REAL ESTATE INCOME AND GROWT	The Connor Group Real Estate Income and Growth Fund XII, LLC

Significant Difference in Legal Name Examples	
Business Name (OH SoS)	Entity Legal Name (LEI Dataset)
ASCENT CHURCH, INC.	Church on the Rise, Inc.
RED BARN SERVICES, INC.	Douds Veterinary Hospital, Inc.
SPCA CINCINNATI	THE HAMILTON COUNTY SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS
WOODS HARDWARE ENTERPRISES, INC.	ACME LOCK, INC.

Source: Ohio Records Summary

In at least some of the cases, when an entity legal name is truncated, it seems reasonable to assume that no important information is lost. However, for certain entities like financial instruments (for example, mutual funds), the last characters of the name could be very important if they are used to differentiate one instrument from another (exhibit 6, middle panel).

We found five such truncations in the Ohio data and eleven in the Massachusetts data.

After matching truncated GLIEF legal name data with Secretary of State data, we had approximately 5 percent of our sample remaining that required visual inspection to determine why differences occur (i.e., categories 3 and 4 in exhibit 5). The visual comparison process is intended to be as strict, objective and consistent as possible in order to reduce the likelihood of confirmation bias. In this situation, confirmation bias means a perhaps-natural human tendency to interpret differences between records in a way that unintentionally favors the hypothesis that the two different Legal Names are probably the

same. As a precaution against such bias, and to illuminate some means by which such bias might be mitigated, this section of the paper seeks to document the exact differences that arise between Legal Names in the business registry and those in the LEI system.

Most differences (4 percent for Massachusetts and 3 percent for Ohio) did not appear to be substantive meaning the differences would likely not be deemed material by a court, bank, or ordinary person in the course of ordinary business. For example, in the Ohio data, an additional 188 names could be accepted as matches by ignoring punctuation (commas and periods, for example, after abbreviations). Another 18 entities could be accepted as matches (again using Ohio data) by applying certain low-risk decision rules, for example, matching the abbreviation “Inc.” with Incorporated, Co. with Company, and “#” with “No.” or “Number.”

We then divided the remaining entities (1 percent of Massachusetts entities and 2 percent of Ohio entities) into two categories based on whether there was a material difference or simply no similarity at all. Approximately one third were grouped in the material difference category. An entity with an additional partner’s name or with a different corporate structure, for example, an entity labelled a Corporation in the Secretary of State but called a Limited Liability Company in GLIEF data (or vice-versa), would be included in the material difference category.

The remaining entities were placed in the no similarity category (exhibit 6, lower panel). There could be explanations, for example based on non-public information or access to court or other records, that could reconcile the two seemingly disconnected names. We did not attempt to investigate any of the individual changes. Over time, it is not unusual for companies to evolve. They may get acquired, merge, declare bankruptcy or emerge from bankruptcy, and then change their names. Since an entity (other than sole proprietor) cannot legally use a business name until the name has been registered as an officially recognized business entity, businesses are highly encouraged to record change of names with their respective business registry.¹⁶

For a company that wishes to participate in regulated financial transactions, annual renewal of LEI may be attractive or even required by one or more regulatory agencies. It appears, however, that several smaller non-financial entities (for example, a church, veterinary clinic, animal shelter, hardware store), after receiving an LEI early after LEIs were first established have chosen to allow their LEI to lapse. Many of the entities in the “No Similarity” category (a little over 50 in the Ohio data) have early registration dates (2012 and 2013) and lapsed LEI status. Broader discussion of the significance of lapsed status follows in a later section.

As a robustness check on this analysis, we performed formal name-match-scoring comparisons of the two data sets.¹⁷ The results did not reveal any issues with the results shown above.

¹⁶ In this context establishing or changing a “doing business as” name or DBA may not require such recordation.

¹⁷ See Cohen et al, 2021.

Dataset Comparison – Principal Business Address

A striking feature of the Ohio Secretary of State dataset is that the vast majority of entities did not show a Legal Address or Principal Business Address.¹⁸ In contrast, the analysis set for Massachusetts shows a Legal or Principal Business Address for all entities.

Equally striking, in both states, among those with a Legal Address, there was a high instance of mismatch between the business registry data and the data in the LEI system across State, State and/or Postal Code (exhibit 7). For example, in only 45.5 percent (Ohio entities reporting a business address) and 54.2 percent (Massachusetts) of the respective cases did all of State, City and Postal Code match between business registry records and GLEIF dataset (green-highlighted cells in exhibit 7). For 29.7 percent of Ohio entities reporting a business address and 22.4 percent of Massachusetts entities, only the State matched between the business registry and LEI addresses (i.e., City and Postal Code) did not match. Finally, for 5.9 percent of Ohio entities reporting a business address and 4.2 percent of Massachusetts entities, none of the State, City or Postal Code matched between the two sources.

Exhibit 7a: Results of State-City-Postal Code Comparisons for Ohio Where Legal or Primary Business Address is Reported in Business Registry

State Match	City Match	Zip Match		Total (c)	Percent (d)
		Y (a)	N (b)		
Y	Y	277	92	369	45.5%
	N	21	181	202	29.7%
N	Y	1	1	2	
	N		36	36	5.9%
Total		299	310	609	

¹⁸ All Ohio entities are required to provide a (local) “Registration Agent” address for correspondence, service of process and similar purposes. In many cases this address represents a law firm, corporate stock agent, or similar third party rather than the entity itself. The Registration Agent address is a separate element of the Ohio business registry dataset than the entity’s business address. This analysis did not attempt to compare LEI addresses with the Registration Agent address.

Exhibit 7b: Results of State-City-Postal Code Comparisons for Massachusetts Where Legal or Primary Business Address is Reported in Business Registry

State Match	City Match	Zip Match		Total (c)	Percent (d)
		Y (a)	N (b)		
Y	Y	1,827	476	2,303	54.2%
	N	165	755	920	22.4%
N	Y	3	2	5	
	N	2	141	143	4.2%
Total		1,997	1,374	3,371	

City Match: Matches raw OR with LEI City in ALL CAPS

Zip Match: Matches raw OR adjusting for LEI and SoS being mismatched by 5- vs 9-digit

	City, State and Zip all match
	State matches but not City or Zip
	None of City, State or Zip match
	Numerator in Percent Calculation

Dataset Comparison – Legal Form

For each of the states, comparison of data on entities’ Legal Form requires a correspondence between the respective entity type categories that exist in each state and the set of GLEIF ELF categories for that jurisdiction (exhibit 8). In general, this mapping is straightforward, because the ELF categories have been established based on the state’s available entity types. That said, the correspondence is not complete and not always one-for-one. Some of the state entity types do not have a corresponding ELF code (e.g., churches, schools and hospitals in Ohio) and presumably would be assigned to ELF code 8888 (“Temporary”) or 9999 (“Other”). Some of the state filing/record types are not related to incorporation of an entity (e.g., UCC filings/liens, Trademarks or Registered Trade Name), reflecting the broader range of functions performed by the business registries. In a small number of cases, the available ELF categories do not appear to correspond to a state entity type.

Exhibit 8a: Mapping Business Registry Entity Types to GLEIF Entity Legal Form Categories Hypothesized Correspondence - Ohio Secretary of State

Ohio Business Type (a)	Business Type Name (b)	GLEIF ELF Code (c)	ELF Name (d)
LL	DOMESTIC LIMITED LIABILITY COMPANY	EZNQ	Limited Liability Company
CP	CORPORATION FOR PROFIT	BTQ1	Corporation (For-Profit)
CN	CORPORATION FOR NON-PROFIT	7VK5	Corporation (Nonprofit)
LP	LIMITED PARTNERSHIP	ZD39	Limited Partnership
CH	CHURCH		
GL	LIMITED LIABILITY PARTNERSHIPS	52U0	Limited Liability Partnership
BT	BUSINESS TRUSTS		
LF	FOREIGN LIMITED LIABILITY COMPANY	EZNQ	Limited Liability Company
06	ATTORNEY		
RN	REGISTERED TRADE NAME		
17	MEDICAL		
CF	FOREIGN CORPORATION	BTQ1	Corporation (For-Profit)
FN	FICTITIOUS NAMES		
PR	PARTNERSHIP	95OK	General Partnership
09	DENTIST		
01	ACCOUNTANT		
03	ARCHITECT		
18	VETERINARIAN		
TM	TRADEMARKS		
		AEJF	Professional Association
		FZMT	Cooperative

- Ent Type with no corresponding ELF Code
- Ent_Type for non-Ohio ("Foreign") entities
- ELF maps to multiple Ent_Types
- ELF has no corresponding Ent_Type

Exhibit 8b: Mapping Business Registry Entity Types to GLEIF Entity Legal Form Categories Hypothesized Correspondence - Massachusetts Corporation Division

Massachusetts Entity Type (a)	GLEIF ELF Code (b)	ELF Name (c)
Domestic Limited Liability Company (LLC)	BYFU	Limited Liability Company
Voluntary Associations and Trusts	Z73Z	Voluntary Association and Business Trusts
Domestic Profit Corporation	ZJTK	Domestic Business Corporation
Domestic Limited Partnership (LP)	GOGQ	Limited Partnership
Nonprofit Corporation	R7QO	Non-Profit Corporation
School		
Registered Domestic Limited Liability Part	CAGH	Limited Liability Partnership
Foreign Limited Liability Company (LLC)	BYFU	Limited Liability Company
Hospital		
Registered Professional Limited Liability		
Savings Bank		
Gas and Electric Companies		
Insurance		
Foreign Corporation	ZJTK	Domestic Business Corporation
Credit Union		
Professional Corporation	6I75	Professional Corporation
Religious (Chapter 180)		
Co-Operative Bank		
Church Corporation		
Trust Company		
Domestic Benefit Corporation	QX9N	Domestic Benefit Corporation (incl prof corps)
Housing Co-Operative	1XME	Housing Cooperative Corporation
Limited Urban Development		
Utility (Water)		
	672E	Cooperative Corporation

- Ent Type with no corresponding ELF Code
- Ent_Type for non-Mass ("Foreign") entities
- ELF maps to multiple Ent_Types
- ELF has no corresponding Ent_Type

One natural metric of interest in this correspondence-based comparison is the number of entities that do not fall into the mapped correspondence (exhibit 9). For Ohio, some 840 entities (18.3 percent) fall outside the mapped categories while some 249 entities (7.4 percent) do so for Massachusetts.

For both states, the majority of these cases of non-correspondence represent assignment of entities to ELF category 8888 or 9999 when that state’s own entity type corresponds to a different GLEIF ELF category. For example, more than 500 Corporations for Profit (in the Ohio business types) were assigned to “Temporary” ELF rather than to ELF category “Corporation for Profit” (BTQ1). Similarly, about 30 entities in each of the Voluntary Associations & Trusts and Domestic Profit Corporations types (in the Massachusetts Entity Type Descriptor) were assigned to the “Temporary” or “Other” ELF categories rather than the corresponding ELF categories (Z73Z and Z1TK, respectively).

The remainder of cases represent assignment to what appears to be an incorrect ELF category based on the state entity types. Excluding this group, about 1.5 percent of entities exhibit Legal-Form mismatches between LEI and Ohio data (68 out of 3,372).

Exhibit 9a: Legal Form Comparison - Ohio Secretary of State

Business Type Code	Ohio SoS Business Type	Entity Legal Form Code										Total (k)	MEMO				
		Limited Liability Company (US-OH) (a)	Corporation (For-Profit) (US-OH) (b)	Corporation (Nonprofit) (US-OH) (c)	Limited Partnership (US-OH) (d)	Limited Liability Partnership (US-OH) (e)	General Partnership (US-OH) (f)	Professional Association (US-OH) (g)	Cooperative (US-OH) (h)	Limited Liability Company (US-IL) (i)	Temporary/ New ELF Requested (j)		Follows Presumed Correspondence (l)	Does Not Follow Presumed Correspondence (m)	Percent Following Presumed Correspondence (n)	Percent Not Following Presumed Correspondence (o)	
LL	DOMESTIC LIMITED LIABILITY COMPANY	2,524	7		5	7		1				116	2,660	2,524	136	94.9%	5.1%
CP	CORPORATION FOR PROFIT	4	821	3				1	1		1	516	1,347	821	526	61.0%	39.0%
CN	CORPORATION FOR NON-PROFIT	1	7	167								137	312	167	145	53.5%	46.5%
LP	LIMITED PARTNERSHIP	1			115	1						3	120	115	5	95.8%	4.2%
CH	CHURCH			6								36	42	36	6	85.7%	14.3%
GL	LIMITED LIABILITY PARTNERSHIPS					23							23	23	0	100%	0%
BT	BUSINESS TRUSTS											22	22	22	0	100%	0%
LF	FOREIGN LIMITED LIABILITY COMPANY	14	2									1	17	14	3	82.4%	17.6%
O6	ATTORNEY		1					1				6	8	6	2	75.0%	25.0%
RN	REGISTERED TRADE NAME		2	1								5	8	5	3	62.5%	37.5%
17	MEDICAL		4									3	7	3	4	42.9%	57.1%
CF	FOREIGN CORPORATION		5									2	7	5	2	71.4%	28.6%
FN	FICTITIOUS NAMES		2			1	1	1				1	5	1	4	20.0%	80.0%
PR	PARTNERSHIP				1	1	3						5	3	2	60.0%	40.0%
O9	DENTIST											4	4	4	0	100%	0%
O1	ACCOUNTANT											2	2	2	0	100%	0%
O3	ARCHITECT		1										1	0	1	0%	100%
18	VETERINARIAN											1	1	1	0	100%	0%
TM	TRADEMARKS		1										1	0	1	0%	100%
Total		2,544	853	177	121	33	4	3	1	1	855	4,592	3,752	840	81.7%	18.3%	

Exhibit 9b: Legal Form Comparison - Massachusetts Corporation Division

Massachusetts Corporation Division Entity Type Descriptor	Entity Legal Form Code (GLEIF)																MEMO			
	Limited Liability Company (US-MA) (a)	Voluntary Association and Business Trusts (US-MA) (b)	Domestic Business Corporation (US-MA) (c)	Limited Partnership (US-MA) (d)	Non-Profit Corporation (US-MA) (e)	Limited Liability Partnership (US-MA) (f)	Domestic Benefit Corporation (incl prof corps) (US-MA) (g)	Professional Corporation (US-MA) (h)	Cooperative Corporation (US-MA) (i)	Housing Cooperative Corporation (US-MA) (j)	Limited Liability Company (US-RI) (k)	Limited Partnership (US-CT) (l)	Profit Corporation (US-FL) (m)	Temporary/New ELF Requested (n)	Other (o)	Total (p)	Follows Presumed Correspondence (q)	Does Not Follow Presumed Correspondence (r)	Percent Following Presumed Correspondence (s)	Percent Not Following Presumed Correspondence (t)
Domestic Limited Liability Company (LLC)	1,643		4	1		5				1		1	15	3	2,660	1,643	30	98.2%	1.8%	
Voluntary Associations and Trusts		658	2										32		1,347	658	34	95.1%	4.9%	
Domestic Profit Corporation	4	1	436		2		30	10	3				32	1	312	436	83	84.0%	16.0%	
Domestic Limited Partnership (LP)				190		3					1		2		120	190	6	96.9%	3.1%	
Nonprofit Corporation			25		103								1		42	103	26	79.8%	20.2%	
School			1		17		1						13		23	13	19	40.6%	59.4%	
Registered Domestic Limited Liability Part						24									22	24	0	100.0%	0.0%	
Foreign Limited Liability Company (LLC)	15														17	15	3	83.3%	16.7%	
Hospital			2		11								2		8	2	13	13.3%	86.7%	
Registered Professional Limited Liability						11									8	0	11	0.0%	100.0%	
Savings Bank			2										9		7	9	2	81.8%	18.2%	
Gas and Electric Companies			4					3					2		7	2	7	22.2%	77.8%	
Insurance													9		5	9	0	100.0%	0.0%	
Foreign Corporation			3										5		5	3	5	37.5%	62.5%	
Credit Union													5		4	5	0	100.0%	0.0%	
Professional Corporation			1					4								4	1	80.0%	20.0%	
Religious (Chapter 180)					4											0	4	0.0%	100.0%	
Co-Operative Bank			1										2			2	1	66.7%	33.3%	
Church Corporation													2			2	0	100.0%	0.0%	
Trust Company		2														0	2	0.0%	100.0%	
Domestic Benefit Corporation			1													0	1	0.0%	100.0%	
Housing Co-Operative									1						2	1	0	100.0%	0.0%	
Limited Urban Development			1												1	0	1	0.0%	100.0%	
Utility (Water)													1		1	1	0	100.0%	0.0%	
Total	1,662	661	483	191	137	43	31	17	3	1	1	1	135	4	3,371	3,122	249	92.6%	7.4%	

Overall Matching Across Legal Name-Business Address-Entity Type

For Ohio entities, the frequency of name matches is highest for LLCs and Corporations for Profit (94 percent and 92 percent, respectively) while lower for Non-Profits, Limited Partnerships, Other Entity Types not mapped into a specific ELF, and entities for which ELF codes appear to be mismatched to their respective Ohio entity Type categories (exhibit 10a). Punctuation issues are relatively infrequent but more common for LLCs, Corporations for Profit and entities with mismatched Entity Types-ELFs.

Among the minority of Ohio entities that report a Business Address, entities with name differences arising from truncation are less likely to fully match City-State-Zip Code than other name-matching categories, while those with name differences from punctuation are more likely to fully match across the three address elements analyzed here (exhibit 11a).

Across the small subset of Ohio entities that provide a business address, the overall likelihood of fully matching the three address elements is lower overall than for Massachusetts (45 percent versus 54 percent for Massachusetts). The frequency of fully-matched address components is highest for LLPs (81 percent and lowest for LPs (35 percent) (exhibit 12a).

For Massachusetts entities, the frequency of exact name matches is high in LLCs and Domestic Profit Corporations (exhibit 10b, showing 93 percent each versus 88 percent overall). Voluntary Associations and Trusts, as well as Limited Partnerships and Nonprofits, tend to have significantly higher frequency of truncations as a source of difference (14 percent, 32 percent and 17 percent, respectively).

Entities with merely punctuation issues seem more likely to have complete city-state-zip matching (exhibit 11b, 61 percent versus 54 percent overall), while those with truncations are less likely (46 percent).

The frequency of mismatches in addresses seem broadly consistent across entity type, and whether or not the ELF category corresponds to the Massachusetts entity type (exhibit 12b). Addresses fully match ("best case," highlighted in green) about half the time for all major entity-type/ELF categories, for entity types without a corresponding ELF code and for records where ELF codes assigned do not match the Massachusetts entity type. Complete mismatch of addresses ("worst case," highlighted in red) is the case, 5.9 percent of the time.

Exhibit 10a: Name Matching by Entity Type - Ohio Secretary of State

Name Match Categories	EntTyp and ELF when matched - Count									Mismatched EntTyp-ELF (j)	Total (k)
	Limited Liability Company (US-OH) (a)	Corporation (For-Profit) (US-OH) (b)	Corporation (Nonprofit) (US-OH) (c)	Limited Partnership (US-OH) (d)	Limited Liability Partnership (US-OH) (e)	Foreign Limited Liability Company (US-OH) (f)	Foreign Corporation (For-Profit) (US-OH) (g)	General Partnership (US-OH) (h)	Temporary/ New ELF Requested (i)		
1. Exact Match (case insensitive)	2,379	757	148	100	23	12	4	3	84	694	4,204
2A. Blank Spaces (Automated)	2	3								1	6
2B. Truncation (Automated)	21	7	12	13					7	23	83
3A. Punctuation (Manual)	90	37	3	1			1		1	39	172
3B. Typo/space missing (Manual)	12	4				1				3	20
3C. Abbreviation (Manual)	1	4	1	1						2	9
3D. Other (Manual)	3					1				1	5
4A. Material Difference (Manual)	5	1	2						3	22	33
4B. Significant Difference (Manual)	11	8	1						6	34	60
Total	2,524	821	167	115	23	14	5	3	101	819	4,592

Name Match Categories	EntTyp and ELF when matched - Percent									Mismatched EntTyp-ELF	Total
	Limited Liability Company (US-OH)	Corporation (For-Profit) (US-OH)	Corporation (Nonprofit) (US-OH)	Limited Partnership (US-OH)	Limited Liability Partnership (US-OH)	Foreign Limited Liability Company (US-OH)	Foreign Corporation (For-Profit) (US-OH)	General Partnership (US-OH)	Temporary/ New ELF Requested		
1. Exact Match (case insensitive)	94.3%	92.2%	88.6%	87.0%	100.0%	85.7%	80.0%	100.0%	83.2%	84.7%	91.6%
2A. Blank Spaces (Automated)	0.1%	0.4%								0.1%	0.1%
2B. Truncation (Automated)	0.8%	0.9%	7.2%	11.3%					6.9%	2.8%	1.8%
3A. Punctuation (Manual)	3.6%	4.5%	1.8%	0.9%			20.0%		1.0%	4.8%	3.7%
3B. Typo/space missing (Manual)	0.5%	0.5%				7.1%				0.4%	0.4%
3C. Abbreviation (Manual)	0.0%	0.5%	0.6%	0.9%						0.2%	0.2%
3D. Other (Manual)	0.1%					7.1%				0.1%	0.1%
4A. Material Difference (Manual)	0.2%	0.1%	1.2%						3.0%	2.7%	0.7%
4B. Significant Difference (Manual)	0.4%	1.0%	0.6%						5.9%	4.2%	1.3%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Exhibit 10b: Name Matching by Entity Type - Massachusetts Corporation Division

Name Match Categories	EntTyp and ELF when matched - Count											Mismatched EntTyp-ELF (l)	Total (m)
	Domestic Limited Liability Corporations (a)	Voluntary Associations & Trusts (b)	Domestic Profit Corporations (c)	Limited Partnerships (d)	Non-Profit Corporations (e)	Limited Liability Partnerships (f)	Foreign Limited Liability Corporations (g)	Professional Corporations (h)	Foreign Profit Corporations (i)	Housing Cooperative Corporation (j)	Other Entity Type (k)		
1. Exact Match (case insensitive)	1,526	552	405	124	79	21	12	3	3	1	38	217	2,981
2A. Blank Spaces (Automated)	5	5		1									11
2B. Truncation (Automated)	14	91	10	60	18	1		1				5	211
3A. Punctuation (Manual)	81	2	14		4		3						13
3B. Typo/space missing (Manual)	7		1									1	9
3C. Abbreviation (Manual)	3	1											4
3D. Other (Manual)	1	3										3	7
4A. Material Difference (Manual)	1	3		1		1						1	9
4B. Significant Difference (Manual)	5	1	6	4	2	1						1	22
Total	1,643	658	436	190	103	24	15	4	3	1	45	249	3,371

Name Match Categories	EntTyp and ELF when matched - Percent											Mismatched EntTyp-ELF	Total
	Domestic Limited Liability Corporations	Voluntary Associations & Trusts	Domestic Profit Corporations	Limited Partnerships	Non-Profit Corporations	Limited Liability Partnerships	Foreign Limited Liability Corporations	Professional Corporations	Foreign Profit Corporations	Housing Cooperative Corporation	Other Entity Type		
1. Exact Match (case insensitive)	92.9%	83.9%	92.9%	65.3%	76.7%	87.5%	80.0%	75.0%	100.0%	100.0%	84.4%	87.1%	88.4%
2A. Blank Spaces (Automated)	0.3%	0.8%		0.5%									0.3%
2B. Truncation (Automated)	0.9%	13.8%	2.3%	31.6%	17.5%	4.2%		25.0%			11.1%	4.4%	6.3%
3A. Punctuation (Manual)	4.9%	0.3%	3.2%		3.9%		20.0%					5.2%	3.5%
3B. Typo/space missing (Manual)	0.4%		0.2%									0.4%	0.3%
3C. Abbreviation (Manual)	0.2%	0.2%										0.0%	0.1%
3D. Other (Manual)	0.1%	0.5%										1.2%	0.2%
4A. Material Difference (Manual)	0.1%	0.5%		0.5%		4.2%					2.2%	0.8%	0.3%
4B. Significant Difference (Manual)	0.3%	0.2%	1.4%	2.1%	1.9%	4.2%					2.2%	0.8%	0.7%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Exhibit 11a: Name Match by Address - Ohio Secretary of State

State Match	City Match	Zip Match	Name Match Categories - Count								Total
			Exact Match (case insensitive) (1)	Truncation (Automated) (2B)	Punctuation (Manual) (3A)	Typo/space missing (Manual) (3B)	Abbreviation (Manual) (3C)	Other (Manual) (3D)	Material Difference (Manual) (4A)	Significant Difference (Manual) (4B)	
Y	Y	Y	253	1	15	2	1	1	2	2	277
		N	84	4	2	1			1		92
	N	Y	19	1	1						21
		N	162	10	7	2					181
N	Y	Y	1								1
		N	1								1
	N	Y	32	2	2						36
Total			552	18	27	5	1	1	3	2	609

State Match	City Match	Zip Match	Name Match Categories - Percent								Total
			Exact Match (case insensitive) (1)	Truncation (Automated) (2B)	Punctuation (Manual) (3A)	Typo/space missing (Manual) (3B)	Abbreviation (Manual) (3C)	Other (Manual) (3D)	Material Difference (Manual) (4A)	Significant Difference (Manual) (4B)	
Y	Y	Y	45.8%	5.6%	55.6%	40.0%	100%	100%	66.7%	100%	45.5%
		N	15.2%	22.2%	7.4%	20.0%			33.3%		15.1%
	N	Y	3.4%	5.6%	3.7%						3.4%
		N	29.3%	55.6%	25.9%	40.0%					29.7%
N	Y	Y	0.2%								0.2%
		N	0.2%								0.2%
	N	Y	5.8%	11.1%	7.4%						5.9%
Total			100%	100%	100%	100%	100%	100%	100%	100%	100%

City Match: Matches raw OR with LEI City in ALL CAPS

Zip Match: Matches raw OR adjusting for LEI and SoS being mismatched by 5- vs 9-digit

- Best Case (City, State and Zip all match)
- Middle Case (State matches but not City or Zip)
- Worst Case (None of City, State or Zip match)

Exhibit 11b: Name Match by Address - Massachusetts Corporation Division

State Match	City Match	Zip Match	Name Match Categories - Count									Total
			Exact Match (case insensitive) (1)	Blank Spaces (Automated) (2A)	Truncation (Automated) (2B)	Punctuation (Manual) (3A)	Typo/space missing (Manual) (3B)	Abbreviation (Manual) (3C)	Other (Manual) (3D)	Material Difference (Manual) (4A)	Significant Difference (Manual) (4B)	
Y	Y	Y	1,629	7	98	71	2	2	2	5	11	1,827
		N	424	3	33	8		2	1	5	476	
	N	Y	146		10	7	1			1	165	
		N	648	1	60	30	6	2	2	2	755	
N	Y	Y	3									3
		N	2									2
	N	Y	2									2
		N	127		10	1			1		2	141
Total			2,981	11	211	117	9	4	7	9	22	3,371

State Match	City Match	Zip Match	Name Match Categories - Percent									Total
			Exact Match (case insensitive) (1)	Blank Spaces (Automated) (2A)	Truncation (Automated) (2B)	Punctuation (Manual) (3A)	Typo/space missing (Manual) (3B)	Abbreviation (Manual) (3C)	Other (Manual) (3D)	Material Difference (Manual) (4A)	Significant Difference (Manual) (4B)	
Y	Y	Y	54.6%	63.6%	46.4%	60.7%	22.2%	50.0%	28.6%	55.6%	50.0%	54.2%
		N	14.2%	27.3%	15.6%	6.8%		28.6%	11.1%	22.7%	14.1%	
	N	Y	4.9%		4.7%	6.0%	11.1%			11.1%		4.9%
		N	21.7%	9.1%	28.4%	25.6%	66.7%	50.0%	28.6%	22.2%	18.2%	22.4%
N	Y	Y	0.1%									0.1%
		N	0.1%									0.1%
	N	Y	0.1%									0.1%
		N	4.3%		4.7%	0.9%			14.3%		9.1%	4.2%
Total			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

City Match: Matches raw OR with LEI City in ALL CAPS

Zip Match: Matches raw OR adjusting for LEI and SoS being mismatched by 5- vs 9-digit

- City, State and Zip all match
- State matches but not City or Zip
- None of City, State or Zip match

Exhibit 12a: Match by Address Component and Entity Type - Ohio Secretary of State

State Match	City Match	Zip Match	EntTyp and ELF when matched - Count									Mismatched EntTyp-ELF (j)	Total (k)
			Limited Liability Company (US-OH) (a)	Limited Partnership (US-OH) (b)	Limited Liability Partnership (US-OH) (c)	Foreign Limited Liability Company (US-OH) (d)	Foreign Corporation (For-Profit) (US-OH) (e)	General Partnership (US-OH) (f)	Corporation (Nonprofit) (US-OH) (g)	Corporation (For-Profit) (US-OH) (h)	Temporary/ New ELF Requested (i)		
Y	Y	Y	178	40	17	4	2	3				33	277
		N	70	11	1	2						8	92
	N	Y	11	5	2							3	21
		N	116	42	1	4	1		1			16	181
N	Y	Y	1										1
		N	1										1
	N	Y	12	15		4	2					3	36
Total			389	113	21	14	5	3	1		63	609	

State Match	City Match	Zip Match	EntTyp and ELF when matched - Count									Mismatched EntTyp-ELF	Total
			Limited Liability Company (US-OH)	Limited Partnership (US-OH)	Limited Liability Partnership (US-OH)	Foreign Limited Liability Company (US-OH)	Foreign Corporation (For-Profit) (US-OH)	General Partnership (US-OH)	Corporation (Nonprofit) (US-OH)	Corporation (For-Profit) (US-OH)	Temporary/ New ELF Requested		
Y	Y	Y	45.8%	35.4%	81.0%	28.6%	40.0%	100%				52.4%	45.5%
		N	18.0%	9.7%	4.8%	14.3%						12.7%	15.1%
	N	Y	2.8%	4.4%	9.5%							4.8%	3.4%
		N	29.8%	37.2%	4.8%	28.6%	20.0%		100%			25.4%	29.7%
N	Y	Y	0.3%										0.2%
		N	0.3%										0.2%
	N	Y	3.1%	13.3%		28.6%	40.0%					4.8%	5.9%
Total			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

City Match: Matches raw OR with LEI City in ALL CAPS

Zip Match: Matches raw OR adjusting for LEI and SoS being mismatched by 5- vs 9-digit

- Best Case (City, State and Zip all match)
- Middle Case (State matches but not City or Zip)
- Worst Case (None of City, State or Zip match)

Exhibit 12b: Match by Address Component and Entity Type - Massachusetts Corporation Division

State Match	City Match	Zip Match	EntTyp and ELF when matched - Count											Mismatched EntTyp-ELF (l)	Total (m)
			Domestic Limited Liability Corporations (a)	Voluntary Associations & Trusts (b)	Domestic Profit Corporations (c)	Limited Partnerships (d)	Non-Profit Corporations (e)	Limited Liability Partnerships (f)	Foreign Limited Liability Corporations (g)	Professional Corporations (h)	Foreign Profit Corporations (i)	Housing Cooperative Corporation (j)	Other Entity Type (k)		
Y	Y	Y	931	289	245	105	73	9	8	1	1	1	23	141	1,827
		N	178	159	37	29	15	5	3	3		10	37	476	
	N	Y	90	5	26	20	6	3	1					14	165
		N	349	204	105	28	6	7	1		2		11	42	755
N	Y	Y	2		1										3
		N	1											1	2
	N	Y	1				1								2
		N	91	1	22	8	2		2				1	14	141
Total			1,643	658	436	190	103	24	15	4	3	1	45	249	3,371

State Match	City Match	Zip Match	EntTyp and ELF when matched - Count											Mismatched EntTyp-ELF	Total
			Domestic Limited Liability Corporations	Voluntary Associations & Trusts	Domestic Profit Corporations	Limited Partnerships	Non-Profit Corporations	Limited Liability Partnerships	Foreign Limited Liability Corporations	Professional Corporations	Foreign Profit Corporations	Housing Cooperative Corporation	Other Entity Type		
Y	Y	Y	56.7%	43.9%	56.2%	55.3%	70.9%	37.5%	53.3%	25.0%	33.3%	100%	51.1%	56.6%	54.2%
		N	10.8%	24.2%	8.5%	15.3%	14.6%	20.8%	20.0%	75.0%			22.2%	14.9%	14.1%
	N	Y	5.5%	0.8%	6.0%	10.5%	5.8%	12.5%	6.7%					5.6%	4.9%
		N	21.2%	31.0%	24.1%	14.7%	5.8%	29.2%	6.7%		66.7%		24.4%	16.9%	22.4%
N	Y	Y	0.1%		0.2%										0.1%
		N	0.1%											0.4%	0.1%
	N	Y	0.1%				1.0%								0.1%
		N	5.5%	0.2%	5.0%	4.2%	1.9%	0.0%	13.3%				2.2%	5.6%	4.2%
Total			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

City Match: Matches raw OR with LEI City in ALL CAPS
 Zip Match: Matches raw OR adjusting for LEI and SoS being mismatched by 5- vs 9-digit

- City, State and Zip all match
- State matches but not City or Zip
- None of City, State or Zip match

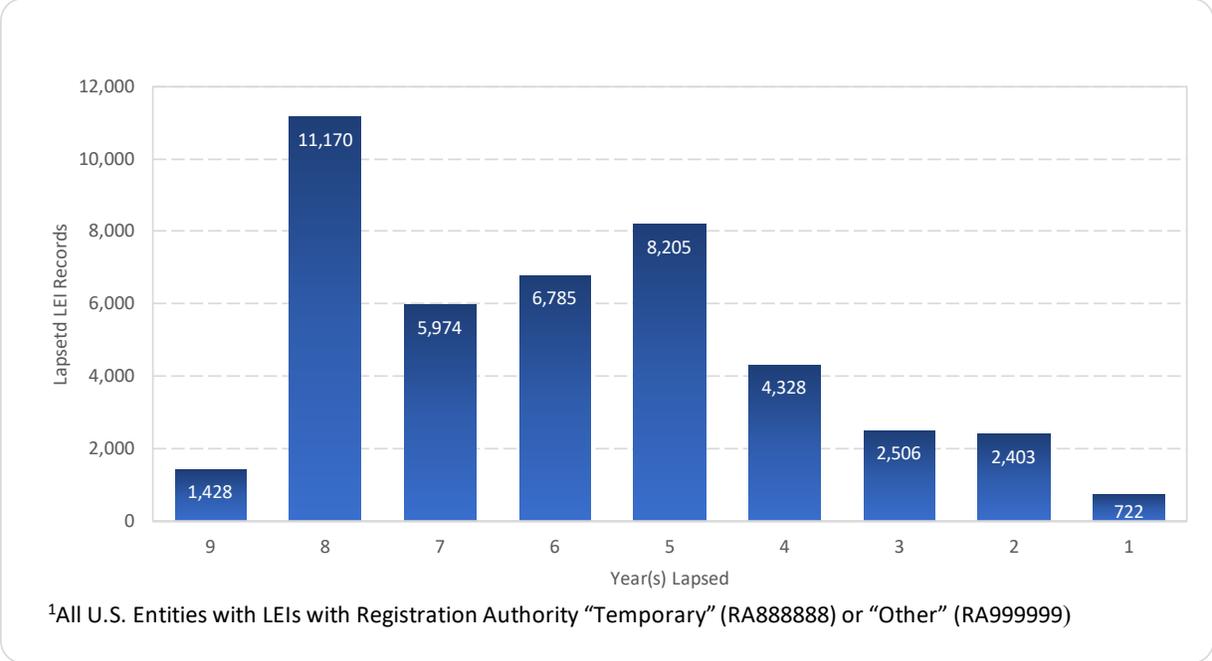
In all of these cases, the patterns of mismatches identified, especially for business addresses, seem difficult to square with having 98 to 99 percent of the LEI records being deemed “Fully Corroborated” by LEI issuers. Indeed, for those entities not required to provide a business address in either incorporation records or annual/biennial periodic reports, it would seem useful for GLEIF or LEI issuers to better identify what sources are being used to corroborate addresses in the LEI records, especially because essentially all of these records show the Validation Authority also being the Registration Authority.

Influence of non-renewed (“lapsed”) LEI records on data quality

One natural question to explore is whether lapsed LEI records might be more likely to exhibit mismatches or other problems than “current” LEI records that have been renewed and maintained on an annual basis, especially when the overall lapse rate of LEIs issued to U.S. entities exceeds 50 percent. For example, lapsed LEIs that were set up several years ago might have preceded the current GLEIF expectations in CDF established and the current set of Registration Authorities had been added. Alternatively, the entity itself might have undergone changes over the period of non-renewal that would have appeared in the business registry records but would not be reflected in the LEI reference data.

Among the full set of U.S. entities with LEIs, some 43,521 of the 53,285 U.S. entities with RA888888 or RA999999 (82 percent) are lapsed. Many of these records have been lapsed for many years (exhibit 13).

Exhibit 13: Lapsed LEI Records by Years Since Last Renewal¹



Nonetheless, there remain nearly 10,000 LEI records that have been maintained as current and yet do not show a valid Registration Authority. Some of these entities may indeed have Registration Authorities not yet on the GLEIF codelist at the time of the analysis (e.g., the Office of Comptroller of the Currency (OCC) for national banks).

Whether or not the absence of valid Registration Authorities in these records might bear a relationship to the lapsed status, the absence may limit the ability for GLEIF to use logical consistency tests on related elements of such records (such as ELF or Jurisdiction of Formation) to monitor or enhance the quality of LEI reference data.

Of the 47,875 U.S. entities with LEIs that show ELF of 8888 or 9999, some 20,238 (42 percent) are lapsed, less than the overall lapsed rate among U.S. entities of more than 50 percent. Of that number, nearly two-thirds are also RA888888 or RA999999. This lack of ELF coverage does not seem as closely related to lapsed status.

Entity-level matched comparisons for Ohio and Massachusetts

Overall, there is a high level of exact matches across the three elements whether or not the entity has a lapsed LEI, particularly for Legal Name and Entity Form (exhibit 14).

When lapsed and current LEIs are compared with regard to Legal Name and State-City-Postal Code, the Ohio and Massachusetts data indicate that lapsed status is associated with a modest increment in the low rate of material or significant name mismatches and in the low proportion of entities for which none of State, City or Postal Code match.

Most strikingly, entities with lapsed LEIs are significantly more likely to have mismatches between the state entity type and the GLEIF ELF. Most notably, Ohio entities with lapsed LEIs were ten times more likely to have entity-form mismatches than those with current LEIs (30.5 percent versus 2.8 percent). The majority of these mismatches involved entities assigned to ELF “8888” or “9999” rather than the ELF category corresponding to that state entity type.

Exhibit 14: Lapsed vs. Current LEI Accounts - Legal Name, Legal Address and Entity Type

	Ohio		Massachusetts	
	Lapsed (a)	Current (b)	Lapsed (c)	Current (d)
Legal Name				
Exact Match	90.7%	92.6%	89.4%	87.7%
Material/Significant Mismatch	3.1%	0.7%	1.2%	0.7%
Legal Address				
State-City-Postal Code all match	47.2%	43.2%	53.1%	55.1%
None of State-City-Postal Code match	5.0%	7.1%	5.4%	3.3%
Legal Form				
Entities for which ELF corresponds to state entity type	69.5%	97.2%	91.6%	92.5%
Entities for which ELF does not correspond to state entity type	30.5%	2.8%	8.4%	7.5%

More detailed data on comparison between entities with lapsed and current LEIs can be found in Appendix IV.

Summary and Conclusions

The goal of this analysis has been to illuminate the issues and challenges faced by those using business registry records to corroborate the identity of a corporate entity. The LEI system provides an instructive case study because its processes are unusually and usefully focused on data sources and methods when compared to, for example, commercial vendor datasets.

Systematic comparison of state registry records against LEI data reveals a high degree of correspondence in many respects along with significant incidence of differences in the data, some of which are substantive from a use-case perspective. Variation in what business registries require from corporate registrants and dataset construction play an important role.

From the perspective of someone using business registry or LEI reference data in their own activities, some data elements are simply not readily available from some business registries. Corroboration activities may involve pay walls or subscription costs. Strategies and resources applied to such activities will need to accept this situation as inherent to the corroboration of LEI identifiers and reference data. Business registries can differ significantly as to whether, in what form or what type of entity address information is collected. Definitions are critical, both for the business registry and the LEI system, as are potential alternative corroboration sources. All may present challenges to the overall transparency of the corroboration process and results.

Matching of Legal Name can be a challenging exercise. Those seeking to corroborate must deal with non-substantive differences (punctuation or abbreviations), situations in which truncation of the name in a record can create uncertainty for name-matching methods and algorithms, and situations in which names simply do not match at all. Strategies in response may include resorting to the full set of information in business registry records (i.e., periodic required reports as well as initial incorporation), reference to entity information from other business registries, or use of other reliable sources (e.g., federal regulatory databases).

The empirical and conceptual challenges associated with corroborating Business Addresses are significant, even when that comparison is limited to State, City and Postal Code. Such challenges are greatly magnified if the elements of Street Addresses would be added to the comparison.

The interviews with business registries drew attention to the important provisions and procedures they take to safeguard and promote the quality of the information in their records. The interviews also acknowledged that users of business registry information to corroborate identities may occasionally encounter erroneous, incomplete, out-of-date or even fraudulent information in those records. Such considerations are beyond the analytical scope of this paper. From the users perspective, complementary efforts and additional information sources can play an important role in the broader due diligence process.

Categorization on the part of corroborators (whether LEI issuers or internal compliance staff) may fall short of data-user expectations. Illustrative examples from this analysis may include possibly-outsized

assignment to “Other” categories (Registration Authority and ELF) and incomplete alignment in practice between the Legal Jurisdiction (states, generally) and Legal Form. As emphasized by GLEIF and LEI ROC’s Data Quality Working Group, the processes can be enhanced by identifying in advance logical relationships and confidence bounds that are expected to be maintained by incoming data.¹⁹

From the standpoint of data corroborators, whether LEI issuers or those onboarding new customers, this analysis provides examples of possible confusion that can arise between primary sources (e.g., Registration Authorities under whose aegis the entity was formed) and secondary sources (e.g., Validation Authorities who also have data on the entity, perhaps associated with licensing, regulatory or disclosure requirements on the entity). If there is a cost advantage to using certain sources rather than others, for example, it may be useful for corroborators to better highlight the sources actually used including when multiple primary or secondary sources are necessary to corroborate with a high level of confidence. In the LEI context, it may be useful to explore the possible value of adding a more focused “Incorporation Authority” concept in the corroboration process, including under what circumstances information from an “Incorporation Authority” might be preferred or even expected as first-best.

There are some data elements used in corroboration that may not always be (readily) available from the business registry or, alternatively, may only be available through subscription fees or other charges. This paper draws attention to some outcomes of LEI corroboration processes that be less consistent with business registry records than might be expected. Systems and users can benefit, at least in concept, from some expectation that corroborators disclose key information about their regular practices and procedures (e.g., rules of thumb that may be used in the corroboration process that might not otherwise be visible to third parties).

From both the corroborators’ and system planners’ perspectives, the foregoing provides further evidence that corroboration of identity data is not a “straight-through processing” exercise. In particular, some differences across data elements may be difficult to screen with automated tools. Clarified expectations could be helpful about the many ways in which corroborators (e.g., LEI issuers) exercise judgments about business registry data. In communicating and evaluating such judgments, LEI issuers and other corroborators could probably find ways on their own to improve the consistency, clarity and correspondence of their efforts over time. Such efforts in turn may lead to new logical or quantitative quality standards for submitted data that can help to mitigate issues on (future) records and renewals.

Lapsed records can become increasingly inaccurate over time as entities evolve and quality standards change. In addition to efforts to improve the rate of renewal, it may be useful to consider whether mechanisms might be established to allow for correction of incorrect or inconsistent reference data, especially in cases for which the problem is significant. At present there is no mechanism under the control of GLEIF, LOUs or authorities to correct or exclude such data. The GLEIF challenge procedure is useful but remains focused on consistency with written procedures rather than judgments made by LEI issuers.

¹⁹ As one example, GLEIF (with strong support from LEI ROC members) introduced in June 2021 new logical and quantitative data screening standards for incoming data on new and renewed LEI registrations. Once the standards are fully implemented in early 2022, incoming records that fail to meet these standards will revert to the LEI issuers submitting such records to review and resubmit the registration data.

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APPENDIX I

Design and Structure of the Global LEI System

The LEI is a global public-private system that assigns a unique identifier to individual legal entities, incorporates corroborated reference data and promulgates this information on an open-source basis. The LEI system is intended to promote better identification of counterparties (Level 1 data) and their organizational hierarchies (Level 2 data). It originated with a June 2012 G-20 statement endorsing a recommendation of the Financial Stability Board (FSB) for a global LEI system among other post-Great Financial Crisis reforms.²⁰

LEI operational and governance processes have transparent sources and methods that involve four main participants.

- **The Entity** applies and provides reference information with annual renewal. Entity also pays a fee.
- **The LEI Issuer** (also referred to as Local Operating Unit or “LOU”) assigns and manages the LEI, corroborates reference data against Registration Authority public records.
- **The Global LEI Foundation (GLEIF)**, a non-profit organized by FSB to oversee LEI System, is funded through a portion of LEI registration fees. After an initial application process, LEI issuers sign a “master agreement” with GLEIF which governs oversight processes, fees and other standards.²¹ GLEIF expectations of LEI Issuers for LEI reference data elements are communicated primarily through the Common Data Format (CDF) and State Transition and Validation Rules (STVR).
- **The LEI Regulatory Oversight Committee (LEI ROC)**, composed of government agencies around the world, sets policy for GLEIF and LEI System.
- **Other parties** include the public and other data users (with access to LEI data by open data license) along with data vendors and other third-party partners.²²

Nearly 1.9 million LEIs had been issued through mid-2021, the “as of” date for this analysis. Growth in LEIs issued has come primarily from regulatory mandates, in particular related to OTC derivative transaction reporting. About 235,000 of these LEIs had been issued to entities with a U.S. legal address.

²⁰ See Financial Stability Board, “A Global Legal Entity Identifier for Financial Markets.” June 8, 2012. Available at https://www.fsb.org/wp-content/uploads/r_120608.pdf. This paper was endorsed in the G20 Leaders Statement after the 2012 Los Cabos Meeting, available at <http://www.g20.utoronto.ca/2012/2012-0619-loscabos.html> (paragraph 44).

²¹ The arrangement, including a link to the master agreement, is summarized in “Global LEI System: a Network of Federated Services” available at <https://www.gleif.org/en/about-lei/gleif-management-of-the-global-lei-system/global-lei-system-a-network-of-federated-services> .

²² Extensive information on the design and operation of the Global LEI System, including more details on the CDF and STVR, are available at www.gleif.org.

Some 28 U.S. Registration Authorities (state business registries, in general) have at least 1,000 registered entities that have obtained an LEI.

In order to corroborate identification and provide reference information, LEI requires certain minimum data elements for the registered entity. As summarized in ISO standard 17442 (Legal Entity Identifier), these are the following: the LEI code itself, which is a 20-character alphanumeric code with no inherent intelligence and two check-digits; Legal Name; Address (Legal and Headquarters); Legal Jurisdiction; Type of corporation/Entity Legal Form (ISO 20275); Registration Authority, generally the business registry under whose authority the entity was organized; Validation Authority, another or complementary authorized source of corroboration data; and Local entity ID (generally associated with the Registration Authority).

Reference data are also collected for ownership information and details of LEI registration, which do not play a role in this analysis.

The LEI system has established written standards for corroboration of data and oversight of LEI data quality.

- GLEIF Common Data File (CDF) specifications, which define terms and describe other expectations.²³
- GLEIF codelists for authorized Registration and Validation Authorities, for Entity Legal Forms and for Accepted Legal Jurisdictions.

In addition, the accuracy of entity information in the LEI system is subject to public challenge through a centralized challenge facility. These challenges are submitted to the respective LEI issuer for evaluation and resolution.

²³ GLEIF (2021a, 2021b and 2021c). Information on the LEI ROC and its policy statements is available at <https://www.leiroc.org/>

APPENDIX II

“Funds” in the LEI System

Definition of Fund within the LEI system is “a collective investment scheme (or pooled investment) beneficially owned by multiple investors and managed on behalf of those investors by an asset manager or by the fund itself.”

Using this broad definition, it is left to LEI issuers to decide the perimeter for “fund” categorization pertinent to the respective jurisdiction.

One legal entity trust might house multiple FUNDS, each assigned with its own LEI.

From 2019 statement p 31: “...for incorporated funds recorded both in the business registry and by the funds registration authority, in addition to the Registration Authority, which should be the Business Registry, the validation of a fund reference data should always be based on the funds registration authority. This means that the Validation Authority of a fund should always be the financial regulator registering the fund. For non-incorporated funds that do not appear in a business registry, the financial regulator will also be the Registration Authority.”

GLEIF and LEI Issuers are responsible for implementing the Funds policy statement. LOUs are expected by GLEIF to have implemented this policy statement by 3/31/2022.

Appendix III

Data for Top Jurisdictions as of June 30, 2021

Appendix III – Exhibit 1: Delaware Division of Corporations

Entity Legal Forms Currently Recognize for Delaware	ELF Code (Version 1.3)	Formed under Delaware, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Delaware ELF Code (f)
		Registration Authority is Delaware Division of Corporations (RA000602) (a)	Formed under Delaware Jurisdiction but Registration Authority is U.S. SEC (Not DDoC) (b)	Formed under Delaware Jurisdiction but Another Known Registration Agent (Neither DDoC nor U.S. SEC) (c)	Formed under Delaware Jurisdiction but Registration Authority is RA999999 or RA888888 (d)	Combined (Total Formed Under Delaware Jurisdiction) (e)	
Limited Liability Company (US-DE)	HZEH	45,508	5	58	5,227	50,798	0
Limited Partnership (US-DE)	T91T	12,186	11	5	1,028	13,230	0
Corporation (US-DE)	XTIQ	9,364	3	35	1,417	10,819	1
Statutory Trust (US-DE)	4FSX	1,877	42	1	507	2,427	0
Limited Liability Partnership (US-DE)	1HXP	96	0	0	4	100	0
Limited Liability Limited Partnership (US-DE)	TGMR	51	0	0	7	58	0
Partnership (US-DE)	QF4W	34	0	0	5	39	0
Unincorporated Nonprofit Association (US-DE)	12N6	0	0	1	2	3	0
Total With US-DE ELF		69,116	61	100	8,197	77,474	1
New ELF Code being requested for jurisdiction.	8888	876	7,180	24	2,038	10,118	na
Jurisdiction not yet on the ELF codelist.	9999	311	0	2	11	324	na
Other ELF code (Not US-DE)	Various	0	0	0	0	0	na
Sub-total		1,187	7,180	26	2,049	10,442	0
Total		70,303	7,241	126	10,246	87,916	1

Appendix III – Exhibit 2: California Secretary of State

Entity Legal Forms Currently Recognized for California	ELF Code (Version 1.3)	Formed in California, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to California ELF Code
		Registration Authority is California Secretary of State (RA000598)	Formed under California Jurisdiction but Registration Authority is U.S. SEC (Not CSoS)	Formed under California Jurisdiction but Another Known Registration Agent (Neither CSOS nor U.S. SEC)	Formed under California Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under California Jurisdiction)	
Limited Liability Company (US-CA)	E14J	5,815	1	30	580	6,426	1
For-Profit Corporation General Stock (US-CA)	H1UM	2,798	6	19	300	3,123	0
Limited Partnership (US-CA)	5HQ4	1,728	0	3	185	1,916	0
Nonprofit Corporation Public Benefit (US-CA)	K7YU	145	0	5	10	160	0
Nonprofit Corporation Religious (US-CA)	CVXK	71	0	0	3	74	0
For Profit Corporation Close (US-CA)	7CDL	68	0	0	0	68	0
General Partnership (US-CA)	SQ7B	12	0	0	43	55	0
For-Profit Corporation Professional (US-CA)	PZR6	50	0	2	1	53	0
Nonprofit Corporation Mutual Benefit (US-CA)	G1P6	18	0	21	0	39	0
Total With US-CA ELF		10,705	7	80	1,122	11,914	1
New ELF Code being requested for jurisdiction.	8888	467	34	159	3,243	3,903	na
Jurisdiction not yet on the ELF codelist.	9999	11	0	3	7	21	na
Other ELF code (Not US-CA)	Various	0	0	0	0	0	na
Sub-total		478	34	162	3,250	3,924	0
Total		11,183	41	242	4,372	15,838	1

Appendix III – Exhibit 3: New York Secretary of State / DFS Insurance Registry

Entity Legal Forms Currently Recognized for New York	ELF Code (Version 1.3)	Formed in New York, By Registration Authority						Memo: Formed under Other Jurisdiction and assigned to New York ELF Code
		Registration Authority is New York Secretary of State (RA000628)	Registration Authority is New York DFS Insurance Registry (RA000747)	Formed under New York Jurisdiction but Registration Authority is U.S. SEC (Not NYSOS or NYDFSIR)	Formed under New York Jurisdiction but Another Known Registration Agent (Neither NYSOS/NYDFSIR nor U.S. SEC)	Formed under New York Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under New York Jurisdiction)	
Limited Liability Company (US-NY)	SDX0	5,776	22	5	48	1,288	7,139	2
Business Corporation (US-NY)	PJ10	1,682	15	3	36	1,050	2,786	0
Limited Partnership (US-NY)	BO6L	233	1	4	7	231	476	8
Not-for-Profit Corporation (US-NY)	51RC	103	1	0	4	37	145	0
Limited Liability Partnership (US-NY)	XIZI	39		0	1	10	50	0
Total With US-NY ELF		7,833	39	12	96	2,616	10,596	10
New ELF Code being requested for jurisdiction.	8888	151	12	128	189	1,689	2,169	na
Jurisdiction not yet on the ELF codelist.	9999	70	3	0	3	21	97	na
Other ELF code (Not US-NY)	Various	0	0	0	0	0	0	na
Sub-total		221	15	128	192	1,710	2,266	0
Total		8,054	54	140	288	4,326	12,862	10

Appendix III – Exhibit 4: Florida Division of Corporations

Entity Legal Forms Currently Recognized for Florida	ELF Code (Version 1.3)	Formed in Florida, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Florida ELF Code
		Registration Authority is Florida Divn of Corporations (RA000603)	Formed under Florida Jurisdiction but Registration Authority is U.S. SEC (Not FDoC)	Formed under Florida Jurisdiction but Another Known Registration Agent (Neither FDoC nor U.S. SEC)	Formed under Florida Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Florida Jurisdiction)	
Limited Liability Company (US-FL)	8N21	5,247	1	13	249	5,510	1
Profit Corporation (US-FL)	TRI2	1,842	2	17	135	1,996	0
Limited Partnership (US-FL)	5DS0	449	1	1	60	511	0
Not-for-Profit Corporation (US-FL)	3N55	239	0	16	29	284	0
Limited Liability Limited Partnership (US-FL)	D155	85	0	0	3	88	0
Total With US-FL ELF		7,862	4	47	476	8,389	1
New ELF Code being requested for jurisdiction.	8888	84	2	83	586	755	na
Jurisdiction not yet on the ELF codelist.	9999	92	0	0	11	103	na
Other ELF code (Not US-FL)	Various	0	0	0	0	0	na
Sub-total		176	2	83	597	858	0
Total		8,038	6	130	1,073	9,247	1

Appendix III – Exhibit 5: Texas Business & Public Filings Division / Trust Company Registry

Entity Legal Forms Currently Recognized for Texas	ELF Code (Version 1.3)	Formed in Texas, By Registration Authority						Memo: Formed under Other Jurisdiction and assigned to Texas ELF Code
		Registration Authority is Texas Business & Public Filings Division (RA000637)	Registration Authority is Texas Trust Company Registry/ Texas Department of Banking (RA000751)	Formed under Texas Jurisdiction but Registration Authority is U.S. SEC (Not TB&PFD or TTCR)	Formed under Texas Jurisdiction but Another Known Registration Agent (Neither TB&PFD/TTCR nor U.S. SEC)	Formed under Texas Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Texas Jurisdiction)	
Limited Liability Company (US-TX)	WYG5	3,105	7	1	6	607	3,726	0
For-Profit Corporation (US-TX)	C5K7	1,600	4	0	39	380	2,023	0
Limited Partnership (US-TX)	FE1L	1,512	1	0	10	283	1,806	1
Nonprofit Corporation (US-TX)	OGSS	154	0	0	5	42	201	0
Professional Corporation (US-TX)	9AAS	24	0	0	0	1	25	0
Professional Association (US-TX)	MXWB	2	0	0	1	4	7	0
Total With US-TX ELF		6,397	12	1	61	1,317	7,788	1
New ELF Code being requested for jurisdiction.	8888	131	0	27	310	762	1,230	na
Jurisdiction not yet on the ELF codelist.	9999	59	1		1	13	74	na
Other ELF code (Not US-TX)	Various	0	0	0	0	0	0	na
Sub-total		190	1	27	311	775	1,304	0
Total		6,587	13	28	372	2,092	9,092	1

Appendix III – Exhibit 6: Ohio Secretary of State

Entity Legal Forms Currently Recognized for Ohio	ELF Code (Version 1.3)	Formed in Ohio, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Ohio ELF Code
		Registration Authority is Ohio Secretary of State (RA000629)	Formed under Ohio Jurisdiction but Registration Authority is U.S. SEC (Not OSOs)	Formed under Ohio Jurisdiction but Another Registration Authority (Neither OSoS nor U.S. SEC)	Formed under Ohio Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Ohio Jurisdiction)	
Limited Liability Company (US-OH)	EZMQ	2,671	0	4	988	3,663	17
Corporation (For-Profit) (US-OH)	BTQ1	892	0	29	10	931	5
Limited Partnership (US-OH)	ZD39	138	0	1	72	211	1
Corporation (Nonprofit) (US-OH)	7VK5	189	0	13	0	202	0
Limited Liability Partnership (US-OH)	52U0	35	0	1	15	51	0
General Partnership (US-OH)	95OK	4	0	0	2	6	0
Professional Association (US-OH)	AEJF	3	0	0	0	3	0
Cooperative (US-OH)	FZMT		0	2	0	2	0
Total With US-OH ELF		3,932	0	50	1,087	5,069	23
New ELF Code being requested for jurisdiction.	8888	846	233	115	1,045	2,239	na
Jurisdiction not yet on the ELF codelist.	9999	0	0	0	0	0	na
Other ELF code (Not US-OH)	Various	0	0	0	0	0	na
Sub-total		846	233	115	1,045	2,239	0
Total		4,778	233	165	2,132	7,308	23

Appendix III – Exhibit 7: Pennsylvania Secretary of State

Entity Legal Form Currently Recognized for Pennsylvania	ELF Code (Version 1.3)	Formed in Pennsylvania, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Pennsylvania ELF Code
		Registration Authority is Pennsylvania Secretary of State (RA000632)	Formed under Pennsylvania Jurisdiction but Registration Authority is U.S. SEC (Not PSoS)	Formed under Pennsylvania Jurisdiction but Another Registration Authority (Not PSoS)	Formed under Pennsylvania Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Pennsylvania Jurisdiction)	
Limited Liability Company (US-PA)	9C19	1,542	0	11	481	2,034	2
Business Corporation (US-PA)	3JTE	1,100	1	20	451	1,572	0
Limited Partnership (US-PA)	HSEV	1,108	0	1	439	1,548	0
Nonprofit Corporation (US-PA)	9EJ6	183	0	18	106	307	0
Limited Liability Partnership (US-PA)	B8KO	22	0	0	8	30	0
Total With US-PA ELF		3,955	1	50	1,485	5,491	2
New ELF Code being requested for jurisdiction.	8888	184	36	169	1,058	1,447	na
Jurisdiction not yet on the ELF codelist.	9999	30	0	0	18	48	na
Other ELF code (Not US-PA)	Various	0	0	0	0	0	na
Sub-total		214	36	169	1,076	1,495	0
Total		4,169	37	219	2,561	6,986	2

Appendix III – Exhibit 8: Illinois Secretary of State

Entity Legal Forms Currently Recognized for Illinois	ELF Code (Version 1.3)	Formed in Illinois, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Illinois ELF Code
		Registration Authority is Illinois Secretary of State (RA000608)	Formed under Illinois Jurisdiction but Registration Authority is U.S. SEC (Not ISoS)	Formed under Illinois Jurisdiction but Another Registration Authority (Neither ISoS nor U.S. SEC)	Formed under Illinois Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Illinois Jurisdiction)	
Limited Liability Company (US-IL)	8RLE	2,471	3	12	747	3,233	1
Business Corporation (US-IL)	AZUK	935	1	75	386	1,397	0
Nonprofit Corporation (US-IL)	HSPI	178	0	10	44	232	0
Limited Partnership (US-IL)	1WZP	145	0	1	79	225	0
Limited Liability Partnership (US-IL)	VUXH	21	0	0	13	34	0
Professional Corporation (US-IL)	78PB	2	0	0	2	4	6
Professional Services Corporation (US-IL)	F5VL	3	0	0	0	3	0
Total With US-PA ELF		3,755	4	98	1,271	5,128	7
New ELF Code being requested for jurisdiction.	8888	38	26	216	993	1,273	na
Jurisdiction not yet on the ELF codelist.	9999	46	0	2	13	61	na
Other ELF code (Not US-IL)	Various	0	0	0	0	0	na
Sub-total		84	26	218	1,006	1,334	0
Total		3,839	30	316	2,277	6,462	7

Appendix III – Exhibit 9: Massachusetts Corporation Division

Entity Legal Forms Currently Recognized for Massachusetts	ELF Code (Version 1.3)	Formed in Massachusetts, By Registration Authority					Memo: Formed under Other Jurisdiction and assigned to Massachusetts ELF Code
		Registration Authority is Massachusetts Corporation Division (RA000613)	Formed under Massachusetts Jurisdiction but Registration Authority is U.S. SEC (Not MCD)	Formed under Massachusetts Jurisdiction but Another Registration Authority (Neither MCD nor U.S. SEC)	Formed under Massachusetts Jurisdiction but Registration Authority is RA999999 or RA888888	Combined (Total Formed Under Massachusetts Jurisdiction)	
Limited Liability Company (US-MA)	BYFU	1,712	6	6	392	2,116	0
Voluntary Association and Business Trusts (US-MA)	Z73Z	688	11	0	218	917	0
Domestic Business Corporation (US-MA)	ZJTK	543	0	10	165	718	0
Limited Partnership (US-MA)	GOGQ	193	0	0	41	234	0
Non-Profit Corporation (US-MA)	R7QO	147	0	3	32	182	0
Limited Liability Partnership (US-MA)	CAGH	43	0	0	9	52	0
Domestic Benefit Corporation (incl prof corps) (US-MA)	QX9N	31	0	0	0	31	0
Professional Corporation (US-MA)	6I75	18	0	1	5	24	0
Cooperative Corporation (US-MA)	672E	3	0	2	1	6	0
Housing Cooperative Corporation (US-MA)	1XME	1	0	0	0	1	0
Total With US-MA ELF		3,379	17	22	863	4,281	0
New ELF Code being requested for jurisdiction.	8888	170	4,306	146	2,203	6,825	na
Jurisdiction not yet on the ELF codelist.	9999	7	2	0	0	9	na
Other ELF code (Not US-MA)	Various	0	0	0	0	0	na
Sub-total		177	4,308	146	2,203	6,834	0
Total		3,556	4,325	168	3,066	11,115	0

Appendix IV

Detailed Comparisons of Current versus Lapsed LEI Records

Appendix IV - Exhibit 1: Current LEI Accounts Level and Aging of Lapsed LEIs - Ohio

Initial Registration Year	All Lapsed LEIs - Ohio Secretary of State										Pct Lapsed After Only 1 Year (l)	
	First Year Of Lapse											Total (k)
	2013 (a)	2014 (b)	2015 (c)	2016 (d)	2017 (e)	2018 (f)	2019 (g)	2020 (h)	2021 (i)	2022 (j)		
2012	11	3	1	3		6	4	3	35	37	103	10.7%
2013		347	36	27	34	62	78	70	144	132	930	37.3%
2014		1	64	11	10	11	24	33	44	31	229	27.9%
2015				71	19	28	44	52	68	85	367	19.3%
2016				1	84	37	33	59	88	59	361	23.3%
2017					1	227	57	62	131	91	569	39.9%
2018							359	59	121	98	637	56.4%
2019							5	393	148	126	672	58.5%
2020								11	458	197	666	68.8%
2021									1	57	58	-
Total	11	351	101	113	148	371	604	742	1,238	913	4,592	
Cumulative Sum	11	362	463	576	724	1,095	1,699	2,441	3,679	4,592		
Cumulative Percent	0.2%	7.9%	10.1%	12.5%	15.8%	23.8%	37.0%	53.2%	80.1%	100%		

Appendix IV - Exhibit 2: Current LEI Accounts Level and Aging of Lapsed LEIs – Massachusetts

Initial Registration Year	All Lapsed LEIs - Massachusetts Corporation Division											Pct Lapsed After Only 1 Year (l)	
	First Year Of Lapse										Total (k)		
	Null (a)	2013 (b)	2014 (c)	2015 (d)	2016 (e)	2017 (f)	2018 (g)	2019 (h)	2020 (i)	2021 (j)			
Null	12											12	
2012		3	3	5	1	5	2	29	8	3		59	5.1%
2013			136	19	24	19	25	44	55	30		352	38.6%
2014				50	16	6	4	18	18	12		124	40.3%
2015				1	92	8	12	10	19	4		146	63.0%
2016						54	11	13	13	10		101	53.5%
2017							66	25	36	10		137	48.2%
2018								117	21	11		149	78.5%
2019								1	184	26		211	87.2%
2020										105		105	-
Total	12	3	139	75	133	92	120	257	354	211	1,396		
Cumulative Sum	12	15	154	229	362	454	574	831	1,185	1,396			
Cumulative Percent	0.9%	1.1%	11.0%	16.4%	25.9%	32.5%	41.1%	59.5%	84.9%	100%			

Appendix IV - Exhibit 3: Lapsed vs. Current LEI Accounts - Legal Name

Name Match Category	Ohio				Massachusetts			
	Lapsed LEIs Only		Current ("Issued") LEIs Only		Lapsed LEIs Only		Current ("Issued") LEIs Only	
	Count (a)	Percent (b)	Count (c)	Percent (d)	Count (e)	Percent (f)	Count (g)	Percent (h)
1. Exact Match (case insensitive)	2,332	90.7%	1,872	92.6%	1,248	89.4%	1,733	87.7%
2A. Blank Spaces (Automated)	2	0.1%	4	0.2%	7	0.5%	4	0.2%
2B. Truncation (Automated)	50	1.9%	33	1.6%	56	4.0%	155	7.8%
3A. Punctuation (Manual)	88	3.4%	84	4.2%	60	4.3%	57	2.9%
3B. Typo/space missing (Manual)	10	0.4%	10	0.5%	5	0.4%	4	0.2%
3C. Abbreviation (Manual)	6	0.2%	3	0.1%	1	0.1%	3	0.2%
3D. Other (Manual)	3	0.1%	2	0.1%	2	0.1%	5	0.3%
4A. Material Difference (Manual)	24	0.9%	9	0.4%	3	0.2%	6	0.3%
4B. Significant Difference (Manual)	55	2.1%	5	0.2%	14	1.0%	8	0.4%
Total	2,570	100%	2,022	100%	1,396	100%	1,975	100%

	Best Case
	Middle Case
	Worst Case

Appendix IV - Exhibit 4a: Lapsed vs. Current LEI Accounts - Legal Address (State-City-Postal Code)
Ohio Secretary of State

State Match	City Match	Zip Match							
		Lapsed LEIs Only				Current ("Issued") LEIs Only			
		N (a)	Y (b)	Total (c)	Percent (d)	N (e)	Y (f)	Total (g)	Percent (h)
Y	Y	63	162	225	47.2%	29	115	144	43.2%
	N	87	14	101	25.4%	94	7	101	35.3%
N	Y			0		1	1	2	
	N	17		17	5.0%	19		19	7.1%
Total		167	176	343		143	123	266	

**Appendix IV - Exhibit 4b: Lapsed vs. Current LEI Accounts - Legal Address (State-City-Postal Code)
Massachusetts Corporation Division**

State Match	City Match	Zip Match							
		Lapsed LEIs Only				Current ("Issued") LEIs Only			
		N (a)	Y (b)	Total (c)	Percent (d)	N (e)	Y (f)	Total (g)	Percent (h)
Y	Y	154	740	894	53.0%	322	1,087	1409	55.0%
	N	335	89	424	24.0%	420	76	496	21.3%
N	Y	1		1		1	3	4	
	N	76	1	77	5.4%	65	1	66	3.3%
Total		566	830	1,396		808	1,167	1,975	

- Best Case
- Middle Case
- Worst Case
- Numerator in Percent Calculation

Appendix IV - Exhibit 5a: Lapsed LEI Accounts - Entity Type vs. ELF Code (Ohio)

Business Type Code	Ohio SoS Business Type	Entity Legal Form											MEMO				
		Limited Liability Company (US-OH) (a)	Corporation (For-Profit) (US-OH) (b)	Corporation (Nonprofit) (US-OH) (c)	Limited Partnership (US-OH) (d)	Limited Liability Partnership (US-OH) (e)	General Partnership (US-OH) (f)	Professional Association (US-OH) (g)	Cooperative (US-OH) (h)	Limited Liability Company (US-IL) (i)	Temporary/ New ELF Requested (j)	Total (k)	Follows Presumed Correspondence (l)	Does Not Follow Presumed Correspondence (m)	Percent Following Presumed Correspondence (n)	Percent Not Following Presumed Correspondence (o)	
LL	DOMESTIC LIMITED LIABILITY COMPANY	1,283	2			5		1				113	1,404	1,283	121	91.4%	8.6%
CP	CORPORATION FOR PROFIT	2	327	2								505	837	327	510	39.1%	60.9%
CN	CORPORATION FOR NON-PROFIT		3	58								134	195	58	137	29.7%	70.3%
LP	LIMITED PARTNERSHIP				48	1						3	52	48	4	92.3%	7.7%
CH	CHURCH			4								29	33	29	4	87.9%	12.1%
BT	BUSINESS TRUSTS											9	9	9	0	100.0%	0.0%
GL	LIMITED LIABILITY PARTNERSHIPS											7	7	7	0	100.0%	0.0%
CF	FOREIGN CORPORATION		4									2	6	4	2	66.7%	33.3%
LF	FOREIGN LIMITED LIABILITY COMPANY	5										1	6	5	1	83.3%	16.7%
RN	REGISTERED TRADE NAME		1	1								3	5	3	2	60.0%	40.0%
06	ATTORNEY											4	4	4	0	100.0%	0.0%
09	DENTIST											4	4	4	0	100.0%	0.0%
01	ACCOUNTANT											2	2	2	0	100.0%	0.0%
17	MEDICAL		1									1	2	1	1	50.0%	50.0%
PR	PARTNERSHIP					1		1				2	2	1	1	50.0%	50.0%
18	VETERINARIAN											1	1	1	0	100.0%	0.0%
FN	FICTITIOUS NAMES											1	1	1	0	100.0%	0.0%
Total		1,290	338	65	48	14	1	1	0	0	812	2,570	1,787	783	69.5%	30.5%	

Appendix IV - Exhibit 5b: Current ("Issued") LEIs Only - Entity Type vs. ELF Code (Ohio)

Business Type Code	Ohio SoS Business Type	Entity Legal Form											MEMO				
		Limited Liability Company (US-OH)	Corporation (For-Profit) (US-OH)	Corporation (Nonprofit) (US-OH)	Limited Partnership (US-OH)	Limited Liability Partnership (US-OH)	General Partnership (US-OH)	Professional Association (US-OH)	Cooperative (US-OH)	Limited Liability Company (US-IL)	Temporary/ New ELF Requested	Total	Follows Presumed Correspondence	Does Not Follow Presumed Correspondence	Percent Following Presumed Correspondence	Percent Not Following Presumed Correspondence	
LL	DOMESTIC LIMITED LIABILITY COMPANY	1,241	5		5	2						3	1,256	1,241	15	98.8%	1.2%
CP	CORPORATION FOR PROFIT	2	494	1				1		1		11	510	494	16	96.9%	3.1%
CN	CORPORATION FOR NON-PROFIT	1	4	109								3	117	109	8	93.2%	6.8%
LP	LIMITED PARTNERSHIP	1			67								68	67	1	98.5%	1.5%
GL	LIMITED LIABILITY PARTNERSHIPS					16							16	16	0	100.0%	0.0%
BT	BUSINESS TRUSTS											13	13	13	0	100.0%	0.0%
LF	FOREIGN LIMITED LIABILITY COMPANY	9	2										11	9	2	81.8%	18.2%
CH	CHURCH			2								7	9	7	2	77.8%	22.2%
17	MEDICAL		3									2	5	2	3	40.0%	60.0%
06	ATTORNEY		1					1				2	4	2	2	50.0%	50.0%
FN	FICTITIOUS NAMES		2			1		1				4	4	0	4	0.0%	100.0%
PR	PARTNERSHIP				1			2				3	3	2	1	66.7%	33.3%
RN	REGISTERED TRADE NAME		1									2	3	2	1	66.7%	33.3%
03	ARCHITECT		1									1	1	0	1	0.0%	100.0%
CF	FOREIGN CORPORATION		1									1	1	1	0	100.0%	0.0%
TM	TRADEMARKS		1									1	1	0	1	0.0%	100.0%
Total		1,254	515	112	73	19	3	2	1	1	43	2,022	1,965	57	97.2%	2.8%	

Appendix IV - Exhibit 6a: Lapsed LEI Accounts - Entity Type vs. ELF Code (Massachusetts)

Massachusetts Corporation Division Entity Type Descriptor	Entity Legal Form (GLEIF)															MEMO				
	Limited Liability Company (US-MA) (a)	Voluntary Association and Business Trusts (US-MA) (b)	Domestic Business Corporation (US-MA) (c)	Limited Partnership (US-MA) (d)	Non-Profit Corporation (US-MA) (e)	Limited Liability Partnership (US-MA) (f)	Domestic Benefit Corporation (incl prof corps) (US-MA) (g)	Professional Corporation (US-MA) (h)	Cooperative Corporation (US-MA) (i)	Housing Cooperative Corporation (US-MA) (j)	Limited Liability Company (US-RI) (k)	Limited Partnership (US-CT) (l)	Profit Corporation (US-FL) (m)	Temporary/ New ELF Requested (n)	OTHER (o)	Total (p)	Follows Presumed Correspondence (q)	Does Not Follow Presumed Correspondence (r)	Percent Following Presumed Correspondence (s)	Percent Not Following Presumed Correspondence (t)
Domestic Limited Liability Company (LLC)	822		238	1		2	7	2	1		1		1	14	3	846	822	24	97.2%	2.8%
Domestic Profit Corporation	1				1									16		266	238	28	89.5%	10.5%
Voluntary Associations and Trusts		80												4		84	80	4	95.2%	4.8%
Domestic Limited Partnership (LP)				78										2	1	81	78	3	96.3%	3.7%
Nonprofit Corporation			25		32											57	32	25	56.1%	43.9%
Registered Domestic Limited Liability Part School						16										16	16	0	100.0%	0.0%
Foreign Limited Liability Company (LLC)	8				9									4		13	4	9	30.8%	69.2%
Foreign Corporation			3											2		10	8	2	80.0%	20.0%
Gas and Electric Companies			2											3		6	3	3	50.0%	50.0%
Credit Union														2		4	2	2	50.0%	50.0%
Hospital					2									2		2	2	0	100.0%	0.0%
Registered Professional Limited Liability						2										2	0	2	0.0%	100.0%
Religious (Chapter 180)					2											2	0	2	0.0%	100.0%
Church Corporation													1			1	1	0	100.0%	0.0%
Insurance													1			1	1	0	100.0%	0.0%
Limited Urban Development			1													1	0	1	0.0%	100.0%
Professional Corporation			1													1	0	1	0.0%	100.0%
Utility (Water)													1			1	1	0	100.0%	0.0%
Total	831	80	272	79	46	20	7	2	1	1	1	1	52	3	1,396	1,288	108	92.3%	7.7%	

Appendix IV - Exhibit 6b: Current ("Issued") LEIs Only - Entity Type vs. ELF Code (Massachusetts)

Massachusetts Corporation Division Entity Type Descriptor	Entity Legal Form (GLEIF)													MEMO			
	Limited Liability Company (US-MA)	Voluntary Association and Business Trusts (US-MA)	Domestic Business Corporation (US-MA)	Limited Partnership (US-MA)	Non-Profit Corporation (US-MA)	Limited Liability Partnership (US-MA)	Domestic Benefit Corporation (incl prof corps) (US-MA)	Professional Corporation (US-MA)	Cooperative Corporation (US-MA)	Housing Cooperative Corporation (US-MA)	Temporary/ New ELF Requested	OTHER	Total	Follows Presumed Correspondence	Does Not Follow Presumed Correspondence	Percent Following Presumed Correspondence	Percent Not Following Presumed Correspondence
Domestic Limited Liability Company (LLC)	821		2			3					1		827	821	6	99.3%	0.7%
Voluntary Associations and Trusts		578	2								28		608	578	30	95.1%	4.9%
Domestic Profit Corporation	3	1	198		1		23	8	2		16	1	253	198	55	78.3%	21.7%
Domestic Limited Partnership (LP)				112		3							115	112	3	97.4%	2.6%
Nonprofit Corporation					71						1		72	71	1	98.6%	1.4%
School			1		8			1			9		19	9	10	47.4%	52.6%
Hospital			2		9						2		13	2	11	15.4%	84.6%
Savings Bank			2								9		11	9	2	81.8%	18.2%
Registered Professional Limited Liability						9							9	9	0	100.0%	0.0%
Foreign Limited Liability Company (LLC)	7												8	7	1	87.5%	12.5%
Insurance											8		8	8	0	100.0%	0.0%
Registered Domestic Limited Liability Part						8							8	8	0	100.0%	0.0%
Gas and Electric Companies			2							3			5	0	5	0.0%	100.0%
Professional Corporation								4					4	4	0	100.0%	0.0%
Co-Operative Bank													3	2	1	66.7%	33.3%
Credit Union			1								2		3	3	0	100.0%	0.0%
Foreign Corporation											3		3	3	0	100.0%	0.0%
Religious (Chapter 180)					2						2		2	0	2	0.0%	100.0%
Trust Company			2										2	0	2	0.0%	100.0%
Church Corporation											1		1	1	0	100.0%	0.0%
Domestic Benefit Corporation				1									1	0	1	0.0%	100.0%
Housing Co-Operative										1			1	1	0	100.0%	0.0%
Total	831	581	211	112	91	23	24	15	2	1	83	1	1,975	1,843	132	93.3%	6.7%